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M^{r}. Lester, Engineer.

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A
HISTORY
OF
BRITISH IMPLEMENTS AND MACHINERY
APPLICABLE TO
AGRICULTURE,
WITH
OBSERVATIONS ON THEIR IMPROVEMENT.

BY

W. LESTER, Engineer.

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THE RIGHT HONOURABLE

LORD SOMERVILLE.

MY LORD,

In being allowed to dedicate the following pages to your Lordship, I feel a sentiment of pride and pleasure, as it affords me an opportunity of publicly expressing my gratitude as a member of that community which are daily enjoying the benefits that are emanating from your Lordship's patriotic and laudable exertions in promoting the best interests of Agriculture.

I am, my Lord,
Your Lordship's most obedient,
Obliged and humble Servant,

W. LESTER.

PREFACE.

From my profession and situation, I am very often solicited by my Farming Correspondents to send them a description, and the current opinion, of those various Implements and Machines which have been at different times introduced to the Board of Agriculture, and offered to the Public. I have, in most cases, referred them to the County Reports drawn up for the Board: but in very few instances has this reference given that satisfactory information which was required. The high price of the Reports collectively, and the voluminous matter an Inquirer has to wade through, before he can select what applies to his own particular concerns, has deterred the Practical Farmer from availing himself of those authorities.

The enquiries of which I speak have all been directed to one point, namely, the most improved Implements and Machines, to expedite and abridge Agricultural Labour, as the most generally interesting information they can receive from a written description, the crop arrangement, and other branches of husbandry, being to them of less importance, on account of the variety of soils and situations, which at all times make it difficult to describe on paper the best mode of practice.

Having made the Improvement of Implements and Machinery applicable to Agriculture, my chief study for the last twenty years, I have collected, at various times, descriptions from works which have been published on Husbandry. But these have been either too voluminous or expensive to be read generally by practical Farmers: on such abstracts

I have made some Observations, with a view to impress the subject more forcibly on the mind of the reader, and to open a field for improvement, that may be highly beneficial to the community.

As the Implements of Husbandry have not, until very lately, been deemed of sufficient importance to engage any author, upon a work solely of their description and use, from which the Farmer might gain instruction and amusement, I have therefore been induced to publish the following sheets, hoping that they may lay a foundation which may, in time, become of some importance, as promotive of the best interests of Agriculture, Manufactures, and Commerce, by circulating, at a small expense, the most approved and expeditious modes of cultivating the earth, and also of collecting, separating, and preserving its produce.

Paddington, March 5, 1811.

W. LESTER.

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ERRATUM.

Page 119, line 16 from the top, *for* " every furrow," *read* " every third furrow."

EXTRACTS

FROM THE

REPORTS OF THE BOARD OF AGRICULTURE,

SO FAR AS RESPECTS

IMPLEMENTS IN HUSBANDRY:

WITH

OBSERVATIONS.

COUNTY OF BEDFORD.

BY THOMAS STONE.

NO REPORT RESPECTING IMPLEMENTS.

OBSERVATIONS.

THIS reporter either saw no implements in the county, or he thought they were of no importance to the farmer, and, consequently, not worthy of any observation. What idea will this give the practical farmer of the value of this report, when he finds the object in which he is most interested not even mentioned? Will he believe that Woburn Abbey, the noble residence and hospitable mansion of that ever to be lamented benefactor of mankind, the late Duke of Bedford, is in this county, where those important experiments towards the improvement of the different implements in husbandry have for many years been exhibited, under the liberal and munificent encouragement of that noble patron of agriculture, from whose example has emanated those seeds of emulation that are now taking deep root in most of the counties of the united kingdoms—THE ABRIDGMENT OF HUMAN AND ANIMAL LABOUR BY MACHINERY, by which means our deserts and wastes will be made to produce, and support with comfort the human species, rendering the air of the cultivated parts more pure, and dispensing liberally all the comforts of life to every industrious class of society?

BERKSHIRE,

BY WILLIAM PEARCE.

THE Berkshire waggon has long been noticed for its peculiar lightness and elegance, and although in different parts of the county it may vary some little in the construction, it combines, in the whole, three great recommendations, viz. easy draught, strength, and, from being built low, is better calculated to load and unload than most other carriages of the kind.

The carts are likewise formed on good principles, and well suited to the respective purposes for which they are wanted.

In a county so pre-eminent in its larger implements of husbandry, it is a matter of surprise that the plough should be found a heavy, clumsy instrument, with a massy beam, share, and mould-board, much better adapted for trenching ploughs, than for the uses required of them.

The smaller implements of husbandry are also formed, in many instances, very awkwardly; and although some spirited farmers have introduced various useful implements from other counties, such as the drill, the skim, and scarifier, (all excellent for the soil of Berkshire,) as well as improving the ploughs and harrows of the county, yet there are still to be found many of the old school so prejudiced, as to think, that without heavy unwieldy instruments, the land would not be properly worked.

To facilitate the operations of agriculture, and to adopt a system of economy in its necessary labour, are very material and obvious advantages, and such as the farmer for his own sake ought to listen to, since his interest is highly connected with their adoption.

I cannot, therefore, withhold censuring, not only the plough at present used in Berkshire, but the mode of working it. Four horses and two men, employed a whole day in turning up an acre of land, even if it be a third tilth, is so extravagant and unnecessary on land such as the greater part of Berkshire consists of, that I cannot but consider it as a national drawback and loss. I am persuaded, a Norfolk or Suffolk farmer would never, in the strongest soil of this county, put more than two horses to a plough, with one man; and he would do as much work, if not more, than four horses and two attendants now do in many parts of Berkshire.

The introduction of the Norfolk wheel-plough is what I strenuously recommend on all light and loamy soils; and the adoption of the Suffolk iron swing-plough, which is more applicable, and better adapted for strong cohesive soils, would be of the greatest advantage to the Berkshire farmer. These ploughs have already been tried with the greatest success for three years past on his Majesty's farms in the Great Park, near Windsor, where there is some of the heaviest, as well as lightest soil in this county, which they work admirably well.

After praising the Berkshire waggon, it may appear somewhat strange that I object to any part of its formation; there is, however, an improvement, which, in my opinion, might be easily effected, and in harvest time would be a material convenience; namely, leaving the space sufficiently deep in the bed of the waggon for the fore-wheels to lock round in the shortest curve; for by the present construction much time is lost to turn at the end of the swaths, and which, by the alteration I suggest, I should hope, would in a great measure be saved, without affecting the symmetry or strength of its present neat form.

COUNTY OF BUCKINGHAM.

BY MESSRS. W. JAMES, AND JACOB MALCOLM,

OF STOCKWELL, NEAR CLAPHAM.

LOOSE handle-swing-ploughs drawn by five, and sometimes six horses, and low wheel-ploughs, both of them heavy and clumsy, at least one horse's draught more than the common plough. In the southern parts they use the Rotheram, the Kentish turn-wrest, the swing, and the high-wheel ploughs. The rollers in the north are much too light; nor are the bush-harrows well contrived, or sufficiently used.

The carts and waggons are upon the common construction, and their great fault is the narrowness of their wheels, which the cross roads are an evident proof of. Cook's Drill but too partially introduced.

OBSERVATIONS.

The greatest objection to broad wheels, upon strong clay soils, is their carrying too much soil upon them in wet weather; and for the same reason Cook's Drill may be too partially used. There is no good drill yet in the country, which has all the requisite qualities.

COUNTY OF CAMBRIDGE.

BY CHARLES VANCOVER.

Quest. WHAT are the usual sorts of ploughs, carts, and other implements of husbandry?

Ans. These are certainly best described by drawings of them; the levelness of the country may be supposed to make only the most simple necessary. The common cart with shafts, waggons with poles, drawn by horses abreast, though shaft-waggons are becoming more general; ploughs with one hale, or single-handed, varying in their size as the soil renders necessary, and these are distinguished by whole Dutch, three-quarter, and half Dutch ploughs; very few implements of experimental husbandry have been introduced. The Drill-Machine has been a little used: a piece of wheat was sown with it last year; every other land was drilled, and the intervening ones sown broadcast; the latter appeared to have the preference at harvest. The experiment was made on land where nothing was to be feared but too luxuriant a crop, and had the summer been as wet as it was dry, the whole would certainly have been laid; there must have been abundance of straw; and the corn, as in the year 1792, on similar lands, very thin and bad. When I say the broadcast was the best crop, I mean the straw was the brightest, and the freest from leaf, and did not seem so high as the straw on the drilled lands; every farmer will therefore conclude the grain was the best, and that there was the most of it. Indeed one would suppose this experiment was made with a view to shew the drill-husbandry to disadvantage; for if I understand its intention, it is of most use on exhausted ploughed lands, where fresh vigour is required to be given to the crop by a fresh moulding; and on such land I have no doubt it would have had the preference.

In the fens, the common fen plough, with a running coulter, which, with the share, is constantly filed and kept particularly sharp, is in constant use. By carrying only two furrows and a half to the yard, about an acre and a half is usually ploughed in a journey of seven hours. To these ploughs is frequently annexed an appendage, which in the fen country is called a Bay, the business of which is to lap in the rushes, reeds, and other early produce of the fens on which the ploughshare lays the earth, and thus completely buries under the soil. (1) It is usual to work three horses abreast in these ploughs, and it is truly astonishing to observe with what dexterity and adroitness the ploughs and horses are managed. The half and three-quarter Dutch ploughs, together with the common swing and foot-ploughs, are in the highland part of the county in general use.

The dagger, whole and half-winged shares, are variously employed, but one general plough, with three occasional different shares, might be introduced with great advantage. The principle so recommended, should be a compound of the Norfolk and Hampshire wheel-plough, with a short well-turned iron plate, inclining gradually to the point of the share. There are no lands in the kingdom which require more attention in ploughing, than the stiff ones in this county. To plough with a regular uniform pitch, and to cut the bottom of the furrows clean and even from side to side, is a great desideratum in good husbandry; but that is not possible to be attended to correctly with the common foot-plough, which is usually resorted to for breaking up the fallows of Cambridgeshire. The foot, at the end of the beam in these ploughs, which drags upon the ground, and is contrived as a regulator to the pitch of the plough, is at so great a distance from the point of friction, as to occasion the share, in strong and hard ground, to be constantly and alternately dipping and rising upwards, rooting too deep, or skimming too shallow. A fixed permanent rest for the beam, as in the wheel-plough, would obviate this objection, and save the ploughman the necessity of setting his plough too deep, which he is continually obliged to counteract, by pressing upon the handle of the plough, and consequently unnecessarily augmenting the draught and weight upon his horses, by the increased friction that is thus induced. The harrows, carts, waggons, and all other implements of husbandry, are after the common sort, and not worth the time of a particular description.

Mr. Shepherd, steward to Mr. Tharpe, of Chippenham, has invented, and now uses, harrows of a particular and uncommon construction. A drawing of these harrows, with their exact proportions, would have been very acceptable. The single harrow appears to consist of five beams, and six teeth in each of the beams are not laid parallel with each other, but fanning and forming the tail of the harrow about six inches wider than the head; the beams are all curved, forming a convex upon the top, and when connected together, a concave space, of about an inch and a half perpendicular, under the middle of the harrow, over and above what would necessarily obtain were the beams straight and parallel to the surface; the teeth are all curved, feather, or basil-edged, and are set springing with their sharp edges and points forward, and their length in the front of the harrow is about six and a half inches, which gradually increases, till, on the tail of the harrow, they are eight inches long. Harrows, thus constructed, have a wonderful effect in drawing into the ground, rather than scratching upon the surface, and in dividing the clods by cutting through, rather than by rubbing or grinding them against each other, and by gathering the twitch grass in the increased space formed by the concavity of its beams, it is rendered an excellent cleansing harrow, and does much credit to the ingenuity of the inventor. (2)

OBSERVATIONS.

(1) This practice, I presume, is derived from Mr. Ducket's Skim Coulter.

(2) No good harrow should gather twitch at all, that is the province of a twitch-rake; a harrow should raise it to the surface, and separate it from the soil, but at the same time discharge it, without drawing it in heaps. A harrow, upon a right principle, should never want lifting up on the foulest land.

COUNTY OF STAFFORD,

BY MR. PITT.

THE implements of husbandry used here for draught, are waggons and carts for tillage, double and single ploughs, with and without wheels, drill-ploughs, harrows, and rollers for other purposes, winnowing machines, straw engines, &c.

The waggons are either with six-inch wheels, or narrow wheels, a few of the former kept by the larger farmers, in which six horses are drawn double, convey a load of from three to four tons. The narrow-wheel waggons are drawn by four or five horses, and carry from two to three tons; six-inch-wheel carts are mostly used about farm-houses for conveying dung, or for gravel or stones, for repairing roads, or for hollow draining. Some few narrow-wheel carts are chiefly kept by small farmers for the road ; one-horse carts also are kept by gardeners, butchers, and people who supply the markets. The wheel-carriages of this county are of a pretty good construction, perhaps not capable of being much improved ; they are, I think, if at all to be condemned, rather too heavy, and should be constructed lighter, if it could be done consistent with the giving them a sufficient degree of strength. Double or two-furrow ploughs are much used, and answer well on light soils, where four horses will plough two acres or more per day. These ploughs are made of a good construction, and require no holder. The single-wheel plough is a very good tool, requiring no person to hold or touch it, except when it is turning at the end of the furrow ; they require but one attendant, for which a boy of fourteen or fifteen years of age is sufficient. And here I cannot but remark the superiority of a plough that requires no holder but a person only to drive the horses, and turn it out and in at the end of the furrow, to one which requires to be held, and the horses of which are guided by reins. These ploughs have lately been much improved by the addition of an iron earth-board firmly screwed to the coulter, called here a Stay, for ploughing turf, which takes off the turf and turns it under the furrow, where the plough immediately covers it with earth ; by this management, a turf at once ploughing, has the appearance of a fallow, and harrows nearly as well. This ploughing is attended with scarcely any extraordinary trouble, but requires the strength perhaps of an extra horse ; it is much used here for turf. (1) The common swing-plough, without wheels, is used to plough hedge sides, ill-formed corners, or any difficult work ; it requires both a holder and a driver. The drill-ploughs used here are of Cook's invention, or an imitation of it, or another made in the North, and sold here by Mr. Joseph Cornforth, machine-maker. The last is the cheapest. They both do their work well, and cover up the seed at the same time, which covering is farther perfected by rolling. The harrows used here have nothing singular in them. The common roller is used ; and sometimes the spiked roller on strong land, with good effect. Large heavy cast-iron rollers, of from one to two tons weight, are used, and are excellent for meadows, or for a rough or cloddy arable land; they require, however, a good strength of horses to draw them. I have lately seen a common corn-roller constructed of two pieces instead of one, being cut through, as it were, and hung with gudgeons in the middle ; the advantage of which is, that, in turning, it is less liable to root up the corn, and may be formed of two short pieces, instead of one longer. Machines for winnowing or dressing corn from the chaff have been long in use here; they are now brought to great perfection, and do their work completely, and with dispatch, requiring not more than half the time necessary in the common way. They are made upon the very best construction, by Mr. Joseph Cornforth, at Bushbury, near Wolverhampton ; the price from six pounds to seven guineas each. (2) Upon the whole, the machinery and implements of this county are tolerably good, and little seems wanting in this way ; and I cannot help thinking, I hope without partiality, that our implements in general, but ploughs in particular, are equal to any, and superior to most which I have seen, and I have viewed those of many counties. Mr. Miller, on this subject, makes the following remark: " The ploughs made in any country where the ploughmen have been most used to them are the best; for when I came to this place I brought with me ploughs and ploughmen out of Leicestershire, which were good ones so long as my Leicestershire men staid; but when they left me, they might as well have taken the ploughs along with them, for Staffordshire men could not plough with them." This remark may serve to shew the difficulty of altering established customs, and that such alterations, even if improvements, must be gradual, and introduced by degrees, as the same workmen are not brought at once to use a new tool expertly ; and unless they in some degree approve of any new practice, to make a fair experiment the master must give his own attention, and do the business himself. (3)

OBSERVATIONS.

(1) This is on the principle of Mr. Ducket's Skim Coulter.

(2) It can be only prejudice or inattention that prevents the more general use of the Winnowing Machine in the southern and western counties.

(3) Mr. Miller's observation on ploughs and ploughmen may in some cases hold good, but I think not generally so. Servants will mostly consult their own ease in the working of any implement, in preference to their master's interest.

SUFFOLK,

BY ARTHUR YOUNG, ESQ.

Ploughing.—In every part of the county this is done with a pair of horses, conducted with reins by the ploughman; and the quantity of land usually turned in a day is an acre of land upon stiff soils, and from one and a quarter to one and a half upon sands. The Norfolk wheel-plough, and the little light swing-plough of Suffolk, are the common implements; the latter is a good tool for depths not exceeding four inches, but a better construction is wanted for greater depths.

A very ingenious blacksmith, of the name of Brand, who has been dead some years, improved the Suffolk swing-plough, and constructed it of iron. I have been informed, that the copse, in its present state, was an improvement of his; if so, it is much to his credit, for there is no other in the kingdom equal to it.

Oxen are used by a few individuals, but no where common.

The form of laying arable lands upon dry soils, is on the flat, with finishing furrows, alternate gathering and splitting; but on wet lands the three-foot Essex ridge of two bouts is most common. In some districts six, eight, and ten feet steatches, a little arched, are used.

Rolling and Harrowing.—In general there is nothing in the practice which demands particular attention ; but I found in the hemp district a management in working clover-lays for wheat, which ought to be noted : a heavy roller follows the ploughs, then a spike-roller ; this prepares well, especially in a dry season.

Dibbling Wheat.—This practice, which there is every reason to denominate excellent, is well established in the county, and increases every year. In the maritime sand district, many thousand acres are thus put in. One farmer, near Dunwich, the year before last, dibbled 258 acres, and this year above 250 ; that is his whole crop, and many others apply the same method for their whole wheat crop. The ground being rolled with a light barley roller, a man walking backwards on the flag, as the furrow-slice is called, with a dibber of iron, the handle about three feet long in each hand, strikes two rows of holes, about four inches from one row to the other, on each flag, and he is followed by three or four children to drop the grains, three, four, or five in each hole. In this way, from six to seven pecks per acre are deposited, at very equal depths in the centre of the flag ; a bush harrow follows to cover it ; the expence eight to nine shillings per acre. There are several circumstances which tend to render this method superior to the common. The treading so equally is very beneficial upon light soil, and in dry weather hurtful upon none. The seed is laid in upon an equal and good depth ; and it is all in the flag itself, and not dropt in the seams, where weeds, if any, will arise ; and there is some saving in seed. The fact is, that the crops are superior to the common, and the sample more equal. It is not common to hoe, except only when one row is put in instead of two ; some use a frame which strikes many holes at a time, but the work is not so well done, and I found the practice not equally approved. The vast system of well-paid employment for the poor, which this practice carries with it, is a point of immense importance. I heard of families who had received, (father, mother, and children,) among them, two guineas a week for six weeks. (2)

Drilling is practised with great intelligence and success by individuals in several parts of the county, but no where has the least tendency to become the common practice; in some districts it declines; and while dibbling spreads rapidly, this practice moves with difficulty; the kinds of drill various—Mr. Cook's variations of Mr. Ridge's, and a new one which promises to be an improvement on all, and which was invented by Mr. Stanton, of Weybread, is now made by Mr. Brock, a millwright at Harlstone.

Waggons are universal in the county; the modern, and greatest of all improvements, that of substituting one-horse carts, or cars, being, generally speaking, unknown; the usual load is ten quarters of wheat to four horses on turnpikes, and five on bye-roads.

Carts are much too heavy, and ill-constructed: they usually contain from 36 to 40 bushels, and are drawn by three, four, or five horses, according to the weight of load.

HORSE RAKE.—This is common; it is drawn by one horse for clearing spring corn stubbles, instead of the corn dew-rake, drawn by one man. It is a very good tool; but to substitute the sickle, and bind in sheaves, is a much superior practice. (1)

THE DRILL-ROLLER.—This tool, invented in Norfolk, gains ground in Suffolk. Its object is to save the expence of dibbling, by making little channels 4½ inches asunder, across a clover-lay, after ploughing; the wheat seed is then sown broadcast, and is covered by a bush-harrow. For light soils, that require pressure, it is a very good implement, but inferior to dibbling. Another use to which it is applicable is, that of pulverizing a fallow on stiff lands in a dry season, in which it is incomparably effective, more so than any spike-roller I have seen.

OBSERVATIONS.

(1) The best employment for the horse-rake would be to rake together couch when ready to collect for burning; for I fully agree with the worthy Secretary, that to bind in sheaves is by far the best practice, whether cut by the sickle or the cradle-scythe, and as it is the full practice of the northern agriculture, I hope it will soon become universal.

(2) The dibbling of wheat on clover-lays, upon all loamy soils, is, without doubt, the best mode of putting in the seed; but upon all stiff retentive clays, the dibble forms a cistern, or reservoir for the water, which very often perishes the corn before it can vegetate, or chills it so that it is not able to stand the winter.

COUNTY OF SURREY.

BY MR. WILLIAM JAMES, AND MR. MALCOLM.

Quest. WHAT are the usual sorts of ploughs?

Ans. Having minutely examined the implements of husbandry used in this county, nothing striking appears. The ploughs in use at this time, in most districts, are nearly similar to those that were used by their grandfathers, and differ only as whim or custom has more or less prevailed. (1) The more customary ones, however, (where the new husbandry has been introduced, and which we beg leave here strongly to inculcate into the minds of every intelligent farmer, as by much the best mode of delivering the grain, is Cook's Drill Machine; and the best hoe is Macdougale's; these are by far the best machines in present use;) are the Kentish turn-wrist, the Rotheram, and Ducket's skim-plough, the swing-plough, and wheel-plough; a horse-hoe, which we have used for several years in hoeing fields of peas, beans, and other articles intended for seed, and which we have uniformly found to answer.

OBSERVATIONS.

(1) The attempt to alter the ploughs of this county, I presume, was from a wish to improve. I cannot believe that the hand of Ducket was guided by whim; and it is well known that it was not by custom.

COUNTY OF SUSSEX.

BY THE REV. ARTHUR YOUNG.

THE accustomed allowance is four horses to every plough, and we find none without three, except the newly improved plough, which, in a few places in the west, has banished the old and clumsily constructed wheel-plough. This new wheel-plough is drawn by two horses abreast, without any driver, moves well in stiff land, and ploughs three-fourths of an acre of land in the same time that a full acre is ploughed by the old plough; a driver and two horses are at one stroke cut off; but this is not all: more land is ploughed, and better, in the same time. (1) But in the Weald a very strong plough is required to break up their stiff soils. The plough most commonly used is the turn-wrist, which breaks up land from 5 to 7 inches deep, better than the foot-ploughs used in Suffolk and Essex, especially when the ground is dry and hard; it will then work steadily, when the best ploughman cannot keep the other in the earth. There is an advantage arising from using it for spring crops sown upon one ploughing, for it turns the furrows perfectly, yet leaves the ground in a more crumbly state than most other ploughs; (though certainly at the expence of a more extraordinary draught;) the lower edge of the furrow, brought up, stands sharp and distinct, and affords, with a few dry days, mould for covering the seed which falls into the hollow, formed by, or between, the furrows. From the weight, of this plough, it is absurd to use it in any work where the soil is in a friable or loose state.

The foot-plough, used in Suffolk, would be a very proper addition to the implements of husbandry used in the Weald, for lessening the expences of cultivating arable land, which are enormous. The harrows for all strong soils (not kept in small ridges) are well executed; and the waggons, taken altogether, are better fitted to a farmer's use in a country which is far from being level, than any other known in the neighbouring counties. The carts have nothing particularly deserving either praise or blame, but are in general made for the carriage of small loads from 16 to 24 bushels.

OBSERVATIONS.

(1) It would be a good thing for the agricultural interest of this country, if this plan was universally adopted upon soils that will admit of it, as it must be absurd in the extreme to employ three horses where two are sufficient.

THE COUNTY OF WARWICK,

BY MR. WEDGE.

CARRIAGES.—The larger occupiers of land, and public carriers, have many of them six and nine-inch-wheeled waggons for the road; but those most generally in use for harvest-work, and employed by the smaller farmers, have narrow wheels. The carts most commonly used for husbandry, have wheels of six or nine inches broad. (1)

OBSERVATIONS.

(1) It would have been desirable, had Mr. Wedge wrote more fully on the implements of this county, as they are very much improved; and, from his known practice, he was capable of giving a proper description of them.

WESTMORELAND.

BY ANDREW PRINGLE.

It has long been known what angle the sail ought to form with the keel to make the ship move in the water with the greatest velocity, but to the present day was reserved the discovery of the angles which the component parts of the plough ought to form with one another, and with the line of draught, in order that that instrument might be worked with the least possible resistance in the performance of its operation. Agriculture cannot but advance with hasty strides, when the principles of philosophy, and the powers of mechanism, are directed to its improvement.

Ploughs.—The ploughs of Westmoreland are light, and although not neatly constructed, they are perhaps not ill suited to the soil they are designed to cultivate; some of them have a wheel at the extremity of the beam, which, it is imagined, serves to keep the furrow of an equal depth. They are drawn most commonly by two, but sometimes by three horses. The turn-wrist-plough is about to be introduced into the county; and it will be of great service in ploughing the sides of the hills, which are very numerous and steep in the arable lands.

Carts.—The carts are of various descriptions and sizes; those most commonly used may be fifty-two inches in length, thirty-six in breadth, and fourteen and a half inches in depth, containing not less than sixteen cubic feet. They are mounted, in some places, upon clog-wheels, and have two-thirds of their length before the axle, which is of wood. There is scarcely a farming waggon to be met with in the county, it being a general opinion, that four horses, in four separate carts, will draw a greater weight, than if they were yoked together in a waggon. (1)

The winnowing machines, which are here very common, and the harrows, are both of the ordinary kinds. The drill-husbandry being yet in its infancy, there are few instruments for hoeing or drilling.

OBSERVATIONS.

(1) It is self-evident, that eight wheels, carrying the same weight, will not cut the roads so much as four. But what was counted a load for four horses, on a waggon, 30 years ago, to move at the rate of two miles and a half an hour, is now drawn seven miles in the same time, by the same number of horses.

COUNTY OF WILTS,

BY MR. DAVIS.

The ploughs used in this district are chiefly of two kinds:

1st. The Hill Country Two-Wheel Plough, with the point of the beam elevated, and swinging upon a brace between the wheels, and the draught-chain fixed almost at the centre of the beam.

2nd. The One-Wheel Plough, so made as to be used by a foot instead of a wheel, in case the land is so wet that the wheel clogs, and will not run round. These ploughs are about eight feet eight and a half long in the beam, and have a long mould-board set at a very acute angle with the sole of the plough, and bent so as to turn down the furrow, or, rather, that the furrow may drop from it as flat as possible.

The two-wheel plough is chiefly used on thin flinty land, where deep ploughing would do mischief; and where, in ploughing shallow, the stones are liable to strike the plough out of ground. In such soils, the farmers are very sensible, that a much lighter and more simple plough would answer as well, or better, provided it was always used by careful experienced ploughmen; and the increase of good ploughmen has occasioned the two-wheel plough to be thrown by in many parts of this district, as expensive and cumbersome. The single-wheel and foot-plough is the most general plough now in use throughout this district, as being applicable to light or heavy land, deep or shallow.

Many attempts have been made to introduce new ploughs into the district, particularly the Norfolk and other light ploughs, and the double-furrow plough, but, as yet, without much success. Perhaps the reason may be, that, in the present common field state of the district, almost every farmer has heavy land to plough as well as light, and frequently both in a day; and, what is worse, land that is frequently so full of couch, that the roots make as much resistance as the land, and are continually choking up the plough.

These reasons have hitherto prevented any lighter or more simple ploughs from coming into general use, particularly any ploughs whose mould-board is short, and obtuse. Wiltshire farmers must be taught to keep their land clean, before they can give up their old ploughs, and this is almost impossible in their present state of common field-husbandry.

The same reasons have also hitherto operated to make the farmer, in this district, almost continually plough with three, and sometimes four horses. Their heavy white land soil, and their steep hills, which they are frequently obliged to plough up and down, on account of the narrowness of the common field-lands, require three horses, while some of their level thin flinty loams might almost be ploughed with one; but as these changes of the soil, and situation, occur almost daily to every farmer, they are always willing to have strength enough for all.

Those farmers who have their land in severalty, and laid in large pieces, are not behind hand in introducing, and using, ploughs calculated for their respective soils; but the majority of the common-field farmers is so great, as to have given the county an almost general character of being bad ploughmen, without considering that it is necessity, and not want of judgment, that makes them so. (1)

Both carts and waggons are used in this district for carrying out dung, but only waggons for hay and corn.

The carts (for as they are provincially dung-pots) are made deep and capacious, on purpose for carrying out dung, and are too heavy and too clumsy for any thing else; indeed they would be almost too heavy for a horse, were it not that, in consequence of the general situation of Wiltshire farm-yards, the greatest part of the dung is to be carried up hill. They are seldom drawn with less than three horses, and sometimes more.

The waggons are rather handsome than otherwise, but are in general too heavy; they are made with a crooked bed, about twelve feet long, and four feet wide, and, in general, run near six feet wide on the ground. They have a narrow nave just to cover the wheels, but seldom use any overlays, or out-riggers, either at the end or sides; the large size of the bed, and the general mode of binding the loads of hay and corn with a waggon-line, on account of the steepness of the hills, enabling them to carry large loads without that assistance.

A Wiltshire narrow-wheel waggon is generally about four feet four inches high in the fore wheels, and five feet eight inches in the hind wheels, and weighs from nineteen to twenty-two hundred weight.

The same kind of harrow is used in this district, and in almost the same way, as in all the western counties. Two or three horses go abreast, each pulling a harrow diagonally, all the harrows being fastened together with a lay-over, (provincially, a rider).

They use a very heavy kind of drag for cleansing their land, with strong iron tines, of near a foot in length. This drag is made oblong, and two of them are hooked together, like two doors. It has been already said, that Wiltshire Down farmers are very cautious of ploughing their land too much, and on that account they make much use of these drags, instead of ploughing, and frequently let in their seed-wheat with them. This idea having been found to answer, has been gradually improved upon. For some years a very heavy triangular machine was used, called A DRAG, with its lines so fixed on its three sides, as that, when drawn by one point, it made parallel furrows eight or nine inches apart; on these furrows they sowed their wheat broadcast; and afterwards, by lightly harrowing the ground, in the same direction as the furrows, they got a great part of the seed into the furrows, and the rest took its chance.

But this machine not going perfectly steady, has been still farther improved, by putting the tines on two parallel beams, usually four, before, at distances of eighteen inches, and five behind, working between them, so as to make parallel furrows of nine inches apart; this is drawn much like a drill-plough, and held by two handles behind, and is called a Nine-share Plough; or, where made with eleven shares, an Eleven-share Plough. (2)

The shape of the tines has also been altered; instead of being straight, they are bent at bottom, the leg part large and hollow, and the foot solid and pointed. These are made strong enough to root up the ground, if ever so hard, into furrrows of a proper depth for sowing. Over these furrows they sow their corn as above described.

All these attempts, though answering the end of keeping the land as solid as possible, were only approximations towards drill-ploughs, but with this difference, that one-third of the seed was deposited at improper depths, or left at top for the birds. A few good farmers have seen this, and have introduced drill-ploughs, and used them with great success. Many kinds of drill-ploughs have been used, but a strong drill-plough, invented by Mr. Moses Boorne, of Downton, seems to be most general, especially for the purpose of sowing such kind of half-ploughed hill-land, in which drag-ploughs have hitherto been used. This kind of plough is calculated to sow at divers widths, but in land that does not require hoeing; from four inches and a half, to six inches and a half, seems to be the distance most in use for wheat.

In exposed situations, the general custom is to drill from east to west, and not from north to south, to prevent the corn from being hurt by the south sun, before it is thick enough to cover the ground.

In the sand veins of this district, drilling of all kinds of corn seems to be getting very fast into use. In such soils, where the use of the hoe is one of the greatest advantages to be derived from drilling, Mr. Cook's

Plough (so made as to be afterwards used for horse-hoeing) is chiefly used.

COMPARISON BETWEEN DRILL-HUSBANDRY AND BROADCAST.—It is not for me to decide on a subject, on which both the best writers and the best farmers in the kingdom have so long been divided in opinion, viz. Whether the drill-husbandry is or is not superior to the broadcast? They have both undoubtedly their merits, or neither of them would have been so long and ably defended.

Different soils and situations require different management; why may not some be particularly adapted to one kind of husbandry, and some to the other? What are the Wiltshire drag-ploughs, but imperfect drill-ploughs? and if the drag-ploughs have been found, by thirty years experience on Wiltshire downs, to ensure good stout clean crops of wheat, surely the application of a drill-box to the very same instrument, so as to deposit all the corn at one depth, must be an improvement.—So much for the down land. As for the sand land, the greatest enemies of drill-ploughs allow their use. In land, in which the seeds of all weeds are sure to vegetate, repeated hoeings are necessary to prevent their choking the corn. If there are any who doubt it, the sand-veins of Wiltshire will convince them; but they must come soon. In seven years time, or less, if the land can be put in severalty, they will, in all probability, scarcely find a broadcast sand farmer in the county.

Perhaps strong clays may furnish objections to drilling, and particularly to drilling wheat. Undoubtedly the reasons given for drilling upon Wiltshire hills do not apply to lands of this description, nor does such land require hoeing like the sandy soils. But it ought to be considered, that nature supplies the use of the drill-plough in strong clays, especially under their favourite crop—WHEAT. The clods, at the time of sowing, are a gauge to determine the proper depth of every wheat-corn; and the pulverization of those clods, by the winter frosts and the March winds, is the hoeing of nature, instead of that of art; and as in such soils the weeds are too few, and grow too slow to do any mischief, no other hoeing is in general wanted.

It may be said, that time and experience will one day decide this argument, but reason must also be called in to determine how far the influence of particular seasons may effect experiments in particular years. It is this influence, and not want of observation in farmers, that has hitherto prevented, and will always prevent, agriculture, from being reduced to one general invariable system. What is right one year, and even for years together, may another year be wrong; and that farmer who happens to suffer severely by pursuing a right system in a wrong year, is shy of it for ever after; especially if he has suffered by deviating from any old mode to which a popular opinion has been long attached. In this case he not only suffers the loss of his property, but is sure to be laughed at by all his neighbours, and even by his own labourers.

In many of the light lands, where ploughing is very little required, unless to destroy the weeds, Mr. Cook's instrument, called a Suffler, which will clean five or six acres per day, has been used with great success, and particularly preparatory to drilling. But this instrument is not yet enough known to be in general use.

As to the proper depth of ploughing, Wiltshire farmers are particularly cautious not to plough below the top soil. Wherever there is a vein of rubbly chalk, or small broken flints immediately under the top soil, they look upon them to be literally "the dross of the land;" and that if they are ploughed up they are "poison." Many instances are shewn where lands of this kind, ploughed too deep (frequently single acres in large tenantry fields) upwards of twenty years ago, have not yet recovered their former goodness. And to preserve this top soil as deep as possible, the best farmers will not permit surface flints to be picked off for the roads, for fear of making the land both lighter and thinner. But in the sand-veins, where there is a great depth of top soil, especially about Lavington, it is not uncommon to plough very deep, and frequently to have a second plough following in the furrow of the first, so as to throw up new soil, and bury that which is supposed to be exhausted.

OBSERVATIONS.

(1) A very rational and candid observation; I wish the same would apply to every county.

(2) The Cultivator is a considerable improvement on the nine-share plough; on the account of its clasping over ridges, and couching into furrows, to an equal depth, with the same facility and regularity, as it does upon the levellest surface. At the same time, by reason of its compass-like form, it is calculated to work effectually all kinds of tilths; which, from the single position of its shares, it neither chokes nor drives the roughest soil on heaps. By its angular form, it couches to all inequalities of the land; and is, upon the whole, the most universal implement, next to the plough, in the whole circle of agriculture; and the plough it supersedes for the purpose of moving and lacerating summer fallows, to destroy root and seed-weeds, in that important season when they are sometimes neglected by the team being wanted for other purposes upon the farm.

THE COUNTY OF WORCESTER.

BY WILLIAM THOMAS POMEROY,

OF FAIRWAY, NEAR HONITON, IN DEVONSHIRE.

The plough is said to have undergone considerable alteration within these last twenty years. The one in general use at present is the hammock-plough. Of such as are peculiar to the county, the double-plough, which is said to be a native, is still confined to the lighter soils to the North. A second is the string-plough, composed chiefly of wood, its beam crooked, body long, and weighty. This, as far as relates to general use, is now almost exploded; it is, however, still found convenient on the deep red soils intended for hop-grounds, on the Teme side, which are prepared for that purpose as follows: two of these ploughs, with a man and boy to each team, are employed following each other; in every other respect the same. They are differently furnished with iron work; the first, which takes off the sod from two to four inches deep, has the wing (here called the feather) of its share extended, and formed into an edge, which terminates with its points on the right hand side; in this position it separates the upper from the under roots of the grass. In this plough particular attention to the edge of the coulter is also paid, that the undermined turf may be so regularly cut, and equally divided on the surface, as to afford the shield-board which follows; both the share and coulter resemble those which (here) are in common use; with the point of the former tending a little downwards; this, following, raises the soil from a considerable depth, and covers the whole. A third, is the large straight heavy plough, more especially peculiar to the vale of Evesham; rather long in the body, and without wheels. On the Cotswold hills, a plough, with one wheel, is seen much on the same construction as those met with in Devonshire, and other western counties. At Culsden, considered as part of these hills, oxen are worked two abreast; a circumstance which seldom occurs in this county. Most of the modern improvements are partially adopted on the lighter soils, but cannot be considered as making very rapid progress towards a more general use. (1) From the number of heavy horses employed, particularly with the hammock-plough, a very fair inference may be drawn that there is great room for improvement.

The harrows are on the usual construction; the waggons and carts are remarkably heavy, those on the Cotswold hills excepted, which are considerably lighter.

The sickle for cutting wheat is said to have been introduced about the year 1750; it is now in general use. The husbandman's tools, on the whole, seem to require much alteration and improvement.

OBSERVATIONS.

(1) A few spirited farmers in a district will, in time, break that stubborn prejudice that checks the progress; for man is rarely blind to his own interest; he is only timid, and wants conviction of the benefit of new modes; but an ill-timed unsuccessful attempt at improvement very often cools the spirit and ardour of a neighbourhood, so that it is sometime before any person has a competent resolution to make a second attempt with hopes of better success.

THE EAST RIDING OF YORKSHIRE.

BY ISAAC LEATHAM.

THE plough, commonly called the Rotheram or Dutch Plough (their construction being nearly the same) is generally used, and is allowed to be the best plough in use for all lands; for though it is of the most simple construction, yet it effectually performs its work. Proud's Trenching or Double-Plough is used by some, and answers well. The first share pares up the sod, and the other turns over the mould upon it. This plough is likely to be very serviceable, if used with judgment. The depth and quality of the soil form the criterion of using it. This plough may be set to different depths. It is requisite to plough up fresh earth, but the skill of the ploughman depends on his not ploughing too deep. The drill is very little used, nor does that use increase. Proud's Drill is the most in use for sowing turnips; it delivers the seed regularly, and may be fixed to any plough. Almost every sort of harrow or roller is to be found here; the lighter ones generally on the Wolds. The harrow teeth are often not sharpened, and when the land is foul, they are not dressed and cleaned, which should be done by a person following, and lifting up the harrow to discharge their contents when they fill. (1)

These inattentions ought to be remedied, as they are very detrimental to the farmer.

The waggons in the greatest part of this district are drawn by two or four horses. They are generally clumsy, with low fore-wheels that lock under the body, which, in course, is raised by heavy cumbersome blocks, and run very heavily. We may hope the propriety of forming them on a better and more light construction, with higher fore-wheels, will soon be perceived. This would be found of great advantage; the farmers' horses would not be harassed by drawing an unnecessary weight, and a considerable saving would be made both of wood and iron in the construction of waggons, more especially those employed in the farms; such as carry corn to market should be stronger and heavier. Few carts are used in many parts of this district, though better adapted for carrying manure than waggons, which are very inconveniently employed for this purpose.

The breast-spade, used in draining, is found very useful; it is driven forwards by a man, in the same manner as the paring-spade, and is not much unlike a common hay-spade, turned up on both sides; it takes out an entire sod, and is very useful in cleaning out furrows, and cutting small grips, or top-drains, in flat lands.

I know of only one thrashing machine in this district. These machines save nearly half the expence; but some doubts have arisen whether the corn is as well thrashed as by hand. No doubt a little deficiency on this head will overbalance the saving. Some also assert that the straw is not so good for cattle, as they do not receive it so fresh as when the corn is gradually thrashed. Another objection has been made to their use, that if they were generally employed, there would be no work for labourers in the depth of winter. I think this objection of no force; for there is little doubt of the labourers finding employment, except in very long and severe frosts: it must be observed also, that even the machine cannot be worked without them. I think the decision, for or against it, depends upon the question, whether it performs the work clean or not: in some instances I have observed it well done, in others so badly, that the corn left in the ear would very nearly have paid for the thrashing. A little more experience, however, will decide the question. It would certainly be an advantage to work them by wind or water; for it is slavish work for the horses, and a horse in a mill is an unpleasant sight. At all events they will not answer but for a large corn-grower, as the interest of the money laid out in the first cost, added to the wear and tear, would be equal to thrashing the crop of a middle size farm by hand. The winnowing machine is generally used, and no considerable farmer should be without it: it is so universally known, that a description of it is unnecessary; the saving of labour, and neatness of execution gives it every recommendation. The price varies from four to six pounds, according to work and materials. (2)

OBSERVATIONS.

(1) Harrows should be so constructed as not to fill; as that is possible, the necessity of attention to clearing them would be avoided.

(2) Probably when a thrashing machine is invented, that will separate the corn from the straw, with the same ease and facility, as the winnowing machine does it from the chaff, they may become universal. I am confident that the adhesion betwixt corn and its straw is not so great, as to require the strength of horses to separate them, if the power made use of were properly applied.

NORTH RIDING OF YORKSHIRE.

BY MR. TUKE.

Carriages.—In the northern part of the Vale of York few waggons are used; the reason assigned for which is, that the country is hilly. Many use two, and others three-horse carts, with three-inch wheels, but most of the farmers have carts which are unusually long in the body, and with broad wheels, for the sole purpose of carrying their hay and corn, and working upon the farm.

In the southern part of the Vale, the Howardian Hills, Rydale, and the Marishes, waggons are pretty generally used, and large heavy carts, drawn by two or three horses, though many farmers keep a light one-horse cart for purposes where a large one is not necessary.

In the dales of the western moorlands, scarce any waggons are used, but generally small narrow-wheel carts, drawn by one horse.

In the dales of the eastern moorlands, very few carts are met with, generally small waggons with low wheels, which do not contain more than from twelve to twenty bushels: to these they yoke two pair of oxen, with one or two horses before them; but on the verge of these moors, and on the coast, more carts are kept, and both the carts and waggons are larger than in the dales.

It is remarkable, that in these dales waggons are generally used, because the country is hilly; but in the dales of the western moorlands, and the northern parts of the Vale of York, carts are used for the same reason; so little has reason and experiment yet determined. (1)

In Cleveland, and that side of the Vale of York contiguous to it, very few waggons are used, generally three-horse carts, which have the horses yoked to them after a singular mode, by putting one horse in the shafts, and two abreast before him; in every other part of the riding the horses are yoked one before another. I apprehend it admits not of a doubt, that three horses yoked in the former manner will draw a greater weight than when single.

Throughout the whole of the north riding, wheels more than three inches broad are very rare; a few carriages are seen in the best cultivated parts, having six-inch wheels, intended chiefly to be used upon the farm, which are found a great convenience.

Thrashing Machines are yet in the hands of very few; they were first made by Bastrick, of Morpeth, the price from eighty to an hundred pounds, exclusive of a roof to cover the wheel and the horses whilst at work. This machine is wrought by two horses, and thrashes and dresses from twelve to fifteen quarters of wheat in twelve hours. A person who has one of them, pays this year to his labourers, for thrashing and dressing his oats by the mill, six pence per quarter; and expects to pay for his wheat, a shilling or fourteen pence per quarter, exclusive of finding the horses for working the machine. (2)

A great advantage arising from this machine is, that of being able to get the corn to market whenever there is an advance.

PLOUGHS.—The plough generally used throughout the north riding is called the Dutch Plough; a short and light swing-plough, and perhaps upon the best construction of any of that kind; in the hands of a good workman, it performs its business well, and requires not a great force to work it; there are a few also of Rotheram ploughs, in the southern part of the riding.

Ploughing is generally performed by two horses abreast, driven by whip-strings held in the hands of the ploughman, except in the northern part of the Vale of York, and in Cleveland, where it is common to plough with three horses, two abreast and one before.

Turnwrist ploughs are not entirely unknown; two or three may be met with in the riding, kept for the purpose of ploughing steep hill sides, to which they are peculiarly adapted.

A few gripping-ploughs are also kept for gripping the furrows of grass land, which is found to be an advantageous practice; but they cut out a sod of about seven or eight inches in breadth, which is more than necessary to carry off the water, and the horses in working poach the furrows very much.

The breast-gripping spade, which is in the hands of a few, is much to be preferred to the last instrument; it cuts a grip of about six inches in width, prevents the inconvenience of poaching the ground by treading, and cuts the grip much straighter and neater than can be done by the plough.

The spade is made of a piece of thin iron, with a socket to admit the end of a shaft three inches broad; each side of the iron is turned up, which cuts the side of the grip, while the middle or bottom part of the iron cuts the bottom of the grip, and the shaft supports the sod cut out, and a boy with a light spade throws it off, which expedites the business very much.

DRILLS—are not general, though several are used in the northern part of the Vale of York, and a few are in the hands of enterprizing farmers in the other parts of the riding. They are chiefly applied to the sowing of turnips and beans: some think they do not answer for other grain. The kinds are the Scotch Drill for sowing of turnips; Cook's Drill, and Perkin's Drill, for sowing any grain; and Proud's Drill for sowing.

HARROWS.—The common two-horse harrow is used to cover the seed; but in many places (though not general) heavier harrows, with longer teeth, drawn by four horses, or a pair of oxen and two horses, are used to clean the land of quicks; each of them consists of four bars (here called bulls) in each harrow, with six teeth in each bull.

QUICKING DRAGS.—In the northern part of the Vale of York, a drag, on an excellent construction, is used for clearing the land from quicks. It consists of two bulls, each six feet long and four inches square, with sixteen teeth, fourteen inches long, in each. At the upper end is a nut and screw, to make it more secure in the bull, to admit of its being more easily taken out to sharpen or repair. The bulls are braced together by two cross pieces of the same substance, eight inches long, between the bull. From each bull rises a pair of handles similar to those of a plough, the one reclining forward the other rejecting backward. Where they cross each other, an iron bar, with a flat head at one end, and a nut and screw at the other, goes through all four of them, and strengthens and braces them together. These handles, which point forward, rest upon the frame of a roller, to which the drag is hung by a chain fastened to each end of the hind bull, passing under the foremost. The fore-handles or stilts rest upon the frame of the roller, by which means the drag may be raised entirely clear from the surface of the ground, and as the teeth have but a very small curve, the couch very readily falls off, and is left in rows ready to be raked up. The roller, which immediately precedes the drag, breaks the clods, and assists the operation of the latter. (3)

A STUBBLE-RAKE, drawn by one horse, is used in the northern part of the Vale of York, for the purpose of raking the stubbles of mown corn. With this implement twelve acres can be raked in one day, by one man and a horse.

HAY-SLEDGE.—In several parts of the north riding a hay-sledge is used for readily collecting the hay together when raked into rows, and intended to be stacked in the field. With this implement and two horses the hay may be got together in much less time than with a carriage.

OBSERVATIONS.

(1) A contradiction that will very often occur, when the people are asked the motives for their different customs.

(2) An excellent plan this to introduce effectually any machinery for the abridgment of labour upon a farm. If you let the labourer share a small portion of the profits with you, and your machines are constructed upon right principles, you are sure to succeed; but when there is no emolument held out to the working man, the difficulties you have to encounter are innumerable. This, with the construction of machines upon bad principles, are the greatest impediments to the advancement of agriculture.

(3) This is a most excellent implement for the purpose of collecting of quicks or couch, and worthy the attention of every farmer whose land is subject to that pest of agriculture.

WEST RIDING OF YORKSHIRE.

BY MESSRS. RENNIE, BROWN, AND SHIRREFF.

PLOUGHS AND CARTS.—In nothing are the farmers of the west riding more deficient than in the construction and management of their ploughs and wheel-carriages: these are essential articles in the practice of husbandry, and are generally most perfect where the best farming prevails.

The same plough, with a few trifling alterations, is universally used over the whole district; it is generally called the Dutch or Rotheram Plough, and was first made by a Mr. Joseph Foljambe, about seventy years ago, who got a patent for it. The fault of this plough lies more in the manner it is yoked, than in the principles upon which it is made. The practice of yoking horses in a line, which prevails over a considerable part of the district, renders it necessary, when putting in the beam, to turn it considerably to the furrow, in order to give the plough what is technically called *land:* owing to this, the horses draw in a contrary direction to the share and coulter, which consequently makes the plough go very unsteady, and from the difference betwixt the direction of the draught and the head upon which the share is fixed, the force of the resistance must necessarily be increased.

Notwithstanding the necessity of turning the beam towards the furrow is entirely owing to the yoking horses in a line, yet so forcible is custom, that even when horses draw abreast, the ploughs have all more or less of this crooked beam. We observe that the sock or share is much shorter and broader in the point than those we are accustomed to, which must make them difficult to work in all gravelly soils, and even in clays, when they are dry.

The half of the mould-board is of cast metal; the upper half is wood, which is very proper, as it is only the under side that wastes with the work.

The prevailing practice, over more than one half of the district, of yoking horses in a line is truly absurd. A horse never works so easy, nor draws so fair, as when going abreast, or in pairs. If land is in that situation as not to bear a horse upon the unploughed part, it is unfit for labouring, and ought not to be touched; but this cannot be sustained as a reason for this practice; for we repeatedly saw three horses in a line, sometimes four, ploughing tender clover-lays. Every person knows the power of old customs and prejudices, and we can only assign this for such an absurd practice.

We apprehend every part of plough-work may be accomplished by two horses, if they are of sufficient strength, and properly maintained. We speak from what we see daily done on our own farms, and those of our neighbours, where land, fully as strong as any we saw in Yorkshire, is constantly ploughed with two horses, and the furrows generally taken deeper. There is no question but where the land is hard and stiff, so much cannot be done, in a given time, as upon lighter soils. But this argument will have the same weight, whatever number of horses are yoked. All we contend for is, that two good horses, yoked abreast in a plough properly constructed, are able to labour any ground, when it is in a proper situation for being wrought. (1) It is proper to notice, that, owing, as we suppose, to ploughing in a line, the work is often very badly performed; there is scarcely a straight ridge to be seen, except in a very few places. The land is generally kept too flat, not being properly acclivated to defend it against the winter rains. We observed this particularly betwixt Thorn and Snaith, where, notwithstanding the soil is upon a wet bottom, yet the ridges are narrow, and not raised at all; at the same time the land near these places was full, straighter, and neater ploughed than any we had seen.

We often remarked, in the course of our survey, that the land was, in general, ploughed too shallow, which not only curtails the pasture of the plants, but also exposes them to be hurt by drought in one season, and drenched by moisture in another. We would lay it down as a rule never to be departed from, that all land ought to be ploughed in direct proportion to its depth, and that where the soil will admit, it ought to be done substantially.

Farm Carriages.—These are carts and waggons of various sizes. The carts, in general, are badly proportioned, being too long in the body, and straight, which makes them heavy upon the back of the horse in going down hill, and the contrary extreme in going up. They are difficult to unload when driving out dung, or performing any home work, and often the sides fold inward, in place of casting out to the wheel, which makes them hold much less than they would otherwise do. They are drawn by two, three, and four horses, and are very unhandy about a farm. The waggons are both upon broad and narrow wheels; they are destructive to the roads, and, in our opinion, of no advantage in carrying on the work of the husbandman.

We suppose that a cart much shorter, and at the same time broader, with sides throwing out, and of a size to be drawn by two horses, is a much better machine for the farmer than the one presently used. If a person will attentively consider the unequal manner in which horses do work, they will soon be convinced of the impropriety of yoking too many together. We think the lighter the cart, and the fewer the horses, the more will proportionally be drawn; at the same time a great saving is afforded in the important articles of tear and wear.

OBSERVATIONS.

(1) What would the reporters do with two horses only, upon the strong clay fallows of Northampton, Buckingham, Bedford, Huntingdon, Cambridge, and Hertfordshire, where the most profitable tilth requires six horses, double, to the plough? I admit, that upon all soils where the power of two horses is sufficient to plough, it would be the extremest folly to use more.

COUNTY OF NORFOLK.

BY N. KENT, ESQ.

THE plough deserves the first notice, as it is compact and light in its construction, does its work remarkably clean, and is easily managed with one handle. The harrows are no ways remarkable. (1)

The waggon is remarkably heavy, which is the less necessary, as none of the roads are rocky. It has, however, one advantage, in being made to lock so far under the bed, that it will turn as short as a post-chaise.

The cart is likewise heavier than is necessary, and three-wheeled tumbrels are seldom used, though they would often save thirty per cent. in the expence of marling.

There is one thing frequently practised in hay and corn harvest, which is the adding a couple of temporary fore-wheels, and a frame, to the common carts, which answers the purpose of a waggon, and in little farms it is a real object of frugality, and in large ones a great help in a busy season. It is called an hermaphrodite. (2)

OBSERVATIONS.

(1) Except that the horses that draw them are drove upon the trot in the same way they drive post-chaises; a barbarous custom, which, I presume, originated for the purpose of clearing them of couch.

(2) An economical plan, and worthy the attention of other counties.

NORTHUMBERLAND.

BY MR. JOHN BAILEY, OF CHILLINGHAM,
AND MR. GEO. CULLEY, OF FENTON.

THE CARTS used in this county are mostly drawn by two horses; they are in general heavy, clumsy, and ill-formed, and such as we think few districts would wish to imitate.

Waggons drawn by four horses are used by some farmers for loading coals and lime; but we hope a few years will shew the absurdity of employing these unwieldy carriages, so destructive to roads, and of so little utility to farmers.

The swing-plough, made in imitation of the Rotheram plough, is in general use through every part of this county; its form is constantly varying, no fixed rules being known for its construction; scarce two carpenters make them alike, differing widely in length and height of the beam, point of yoking, form of mould-board, &c. By observation, experience, and remedying defects when pointed out, some of them have obtained the art of making very good ploughs, whose forms are nearly what they ought to be.

HARROWS.—A large heavy harrow, called a Brake, is commonly used for reducing rough land, especially fallows. Single-horse harrows, containing four bulls, and twenty-four tines or teeth, five or seven inches long, (below the bull,) are generally used for harrowing in seed after it has had a single tine by the brake. A man drives three horses, and every horse draws his own harrow. Some people use two-horse harrows, joined in the middle by crooks and loops, and also small light harrows with short tines, for putting in grass-seeds.

ROLLERS, for reducing cloddy land, rolling wheat in the spring, and grass-seeds, are mostly made of wood; they are generally five feet and a half long, and from twelve to thirty inches diameter: those used for flattening the one-bout ridges, for drilling turnips upon, are only nine or ten inches diameter.

DRILLS.—Those used for drilling are mostly hollow cylinders of tin, with holes of a sufficient size for letting the seed drop out. The defect of this drill is, that when the holes are made of a due size for sowing a proper quantity, they are apt to stop, by which means considerable spaces are sometimes unsown. To remedy this, the holes are made wider, but then much more seed is sown than necessary.

For sowing the different kinds of grain, the drill, with globular cavities on the outside of a solid cylinder, is used in preference to Cook's drill. All these drills are defective, in not being able to regulate the quantity of seed sown to suit soils, seasons, &c. &c. (1)

THRASHING MACHINES are now becoming general in the northern parts of the county; they are all upon the principle of the flax-mill, which principle was first introduced into this county for thrashing of corn, by Mr. Edward Gregson, near twenty years since. About this time Mr. Oxley erected a thrashing machine at Flodden, moved by horses, in which the corn was fed in betwixt two fluted rollers, and struck by switchers, placed as those are in the present machines, only they hang on hinges. Those in use now, and of Mr. Gregson's, are fixed. The complaint of Mr. Oxley's machine was, that it did not thrash common oats clean; probably, for want of velocity; for it is found in the machines now used, that if the switchers move with a velocity of only 1500 feet per minute, they will not thrash clean; and experience has proved that, to thrash common oats clean, requires a velocity of 2500 feet per minute. (2)

The machine Mr. Gregson used was worked by one man, who could thrash with it eighteen bushels of wheat in a day; but being hard work, and Mr. Gregson dying soon after, it was neglected. Mr. Thomas Gregson informed us, that his brother Edward took the idea from something of a similar nature he had seen in Scotland; probably the same which Mr. David Meldrum gives an account of, about the same time, in a letter to Mr. William Charge, of Cleasby, in the county of York, which he describes as being the same as the flax-mill; that it thrashed 150 bushels of oats a day, which dropped through a screen into a winnowing machine that dressed them at the same time.

We were informed by Francis Kinlock, Esq. of Gilmerton, in Scotland, that while he was attempting to perfect Mr. Ilderton's machine, he saw a flax-mill made for the use of poor families, worked by a man; it struck him that it would thrash corn, and he got one made, with the addition of two smooth rollers for taking in the corn. The work being too hard for a man, he sent it to Mr. Mickle's mill, to have it tried by water. Soon after, Mr. Mickle's son built a thrashing-mill at Kilbogie, and, after ten or twelve had been erected in the neighbourhood by other workmen, he applied to Mr. Kinlock to take out a patent, who told him that he did not look upon it as an original invention, and that a patent would not be of any use. Some time after this Mr. Mickle took out a patent (for England only) in his own name, for the making of a machine whose leading principle had been applied to the same purpose at least ten years before.

These machines are moved by water and by horses; the former is certainly the best power, where it can be got, as most of those that have been erected lately require four horses. The best and simplest we know, that goes by two horses, is at Doddington, erected by Mr. Wilkie, the late tenant, the expence of which was about sixty pounds.

In those which have a winnowing machine under them, the corn and straw is thrown together upon a screen, through which the grain drops into the winnowing machine, and from off which the straw used to be taken by a man; but a circular rake, invented (by Mr. Bailey, who first applied it in his machine at Chillingham) about four years since, performs the work much better, and saves the expence of a labourer. This rake is now added to all those that have been lately erected, and only an addition to the machinery of one light wheel. (3)

Some of these machines will thrash and winnow twenty-four bushels of wheat in an hour; but the quantity thrashed in a given time depends on the quality of the corn, and the length of the straw.

The number of hands required are, a woman to feed the machine; another, to hand the sheaves to the feeder; a third, to receive and riddle the dressed corn.

The winnowing machine is in universal use here; we believe very little, if any, corn is dressed by any other means. They were first invented by a farmer of a mechanical genius, called Rogers, who lived at Cavers, near Hawick, and whose grandson, now a carpenter there, still makes them; and perhaps of as useful a form as any other person, and at as low rates as from two pounds eight shillings to three pounds.

Old Rogers, as we were told by his descendant, happened, in the year 1733, to see a machine thrown out of the way as useless, in an old granary at Leith, (young Rogers says, that he believes the machine his grandfather saw at Leith was brought from Holland; and the writer of this article has somewhere read or heard, that the Dutch brought them from the Chinese, who were probably the first inventors; and it is remarkable that a small farmer, in a remote part of Scotland, should bring into notice this most useful instrument, which we now would not know how to do without,) of which he took such notice, that, on his return home, he set about making one, which he sold to the late Mr. John Gregson, of Wark, by whose recommendation they were tried by others, and for many years have been universally used.

OBSERVATIONS.

(1) A perfect good drill would be a desirable machine in this country, but it is well known we have unfortunately no such thing.

(2) This velocity fully proves, that the scutching principle is a bad one; and that it must always require a great power to work it, which will, in a short time, destroy the machine, or put the proprietor to a constant annual expence to keep them in repair.

(3) This additional machinery and expence appears to me to be of no use, except the screening of the corn from the straw, which may be done without the circular rake, by the straw falling over the screen by its own gravity: for a man must be employed to take away the straw, whether it lies nearer or farther from the machine; so that the labour is the same; for it must always be removed to the same distance to keep the machine clear.

COUNTY OF NOTTINGHAM.

BY ROBERT LOWE, ESQ.

THE plough generally used in this county is the Dutch swing-plough, which is found to answer very well, their gate or bottom being from two to two and a half feet, with a pair of hales or handles at a proper height to hold.

In the Vale of Belvoir the two-wheeled plough is used, which is made at Moor Green, near Nottingham. A one-wheeled plough is used near Nottingham, south of Trent, with two horses. A one-wheeled drill-plough, for turnips, is likewise made at Moor Green, which is much approved. The one-horse plough (on the recommendation of Charles Chaplin, Esq. of Tathwell, in Lincolnshire,) has been tried with success at Averham, Farnsfield, and Norwood Park. It appears perfectly sufficient for all the ploughings (particularly on light land) except breaking up a swarth, and makes great dispatch in the sowing of turnips. At the latter place it was used this spring, on a strong red loam, to sow barley and oats, and from this trial appears to do well, even in strong land that has been previously worked pretty fine. In consequence of an experiment made at Norwood Park, the seventh of last February, before some good judges, eight of these ploughs are bespoke. They are made at Wragby, in Lincolnshire, by Mr. Watkinson. Some of Mr. Cook's drill machines have been introduced and approved. The drill part of the Moor Green plough may probably be easily adapted to this plough.

The harrow is adapted to the soil; in the light soils, light, and short tined; in strong heavy soils, heavy, and longer tined. Each harrow has its horse, three or four being sometimes drawn without being, as in other places, connected together.

Mr. Jones, of Arnold, has a curious thrashing machine, which, with some kinds of grain, succeeds very well, but is expected to be brought to greater perfection.

Waggons and Carts.—The waggons of this county are of a middle size and height; the farmers have generally boards to fix on the top of their waggons, which they fasten with stays put into staples, and by these means they make them hold a larger quantity. For top loads or harvestings, they have raves or shelvings, so called; these are in two parts, and put on at twice; they are very light, and, when on the waggons, are twenty-four feet long, and eight feet wide, which gives plenty of room to load upon. Waggons are very numerous; on small farms, two; and upon larger, three or four; carts being seldom used here in the harvest. Carts, here, are made to tilt, or slot, which makes them shoot their load at once.

A very useful, though, at first sight, insignificant implement, has been lately introduced, called a Turnip-rape, to relieve cattle which (as frequently happens) are choked in eating turnips. A piece of stiff rope, hard wrought, about four feet long, is left to fuzz out at the lower end, like a mop; at the upper end is a loop to pull it up again, when thrust down the beast's throat. (1)

OBSERVATIONS.

(1) When the turnip-rape is used, and not found successful, the beast should be gagged, and a hand thrust down to the root of the tongue. I had a cow, in the year 1798, that was choked with a potatoe, and could not be relieved by this instrument; in consequence of which I had her slaughtered; and, when the head was cut open, the potatoe was found lodged upon the top of the wind-pipe, immediately under the prominent part of the tongue, which prevented the animal from breathing, and caused it to swell, by means of the rarification of the pent air in the lungs, and which might have been relieved by the hand.

COUNTY OF OXFORD.

BY RICHARD DAVIS.

THE ploughs used in this county are of various sorts; but the most general practice is, to use the long swing or foot-ploughs, on the strongest lands, or for breaking up the lays; and the wheel-ploughs, (sometimes with one, and sometimes two wheels,) for stirring the fallows, or for the ploughing of the light lands. It is seldom seen, that less than four horses are used, even on light lands, though, in many places, two horses, with a proper plough, would be quite equal to the work. The using more horses than are necessary, seems to be little attended to by the farmers of this county. (1)

Waggons are very generally used for bringing home the corn at harvest, and carrying it to market; and carts, for the purpose of carrying the manure to the land.

OBSERVATIONS.

(1) Probably they train them for the waggon, or the dray, and may think, that working them lightly at plough, is nothing more than giving them regular exercise.

COUNTY OF RUTLAND.

BY JOHN CRUTCHLEY.

SUMMER fallowing is universally practised; winter fallows, by a few people only; but the practice gains ground: the only manures are dung and lime, no particular attention is paid to the making of compost dunghills. There are no implements of agriculture peculiar to the county. The Leicestershire single-wheel, and double-furrow ploughs, have been lately introduced, and bid fair to banish the old long-beamed swing-ploughs. (1) The harrows are seldom large or heavy enough; the rollers are mostly too light, none fit for grass-land. Horses alone are made use of; there is only one ox-team in the county.

OBSERVATIONS.

(1) The improvement of the ploughs in Leicestershire, within the last twenty-five years, is great indeed.

COUNTY OF SALOP.

BY J. BISHTON.

THE single-plough, with two wheels under the fore-end of the beam, is the best sort of plough for level land, and almost in general use in the turnip-soils; two horses, either coupled, or at length, with a boy, plough an acre and a half per day, with ease. (1)

OBSERVATIONS.

(1) This is undoubtedly the best plough upon all light soils; but of no use upon the heavy ones, that is, for the first ploughing.

COUNTY OF SOMERSET.

BY J. BILLINGSLEY, ESQ.

OF ASHWICK GROVE.

FORMERLY the ploughs used here were the most awkward and ill-contrived that could be conceived; but they have, in a great measure, given place to the double-furrowed plough, which was introduced to this neighbourhood by a speculative man who turned farmer on these lands, disregarded and despised by all practical husbandmen. At first he became an object of ridicule to all around him; even his friends considered that ruin must be the inevitable consequence of such rash and ill-judged speculation. However, by means of activity and perseverance, he has not only weathered the storm, but has the satisfaction of seeing the example which he has set, followed by the inhabitants of many surrounding parishes. (1)

Though common farmers are for the most part backward in adopting new plans, yet I never knew any valuable discovery that they did not sooner or later fall into; so it happened with the double ploughs; for ten years did the person, above alluded to, use this instrument; and was constant, in season and out of season, in recommending it to others, (for they who have a true taste for agriculture, enjoy themselves in the communication of every useful discovery,) but all in vain; the more warm he was in enforcing its utility, the more reluctant were the common renters in adopting the use of it; and in all probability it would have remained to the present day, undistinguished for its superiority, had not the same been manifested at the different trials of ploughs, exhibited under the direction of the Bath Agricultural Society. (2)

The ploughs, drags, harrows, rollers, waggons, and carts, now used, are much the same as they have been for sixty years past. Of late, the double-furrow plough has gained ground very fast; all who have tried it acknowledge its superiority for light soils, and for ploughing the barley or turnip land.

OBSERVATIONS.

(1) Too much praise or reward cannot be given to the man who has had the resolution to persevere, for ten years, in introducing a new and beneficial practice into a country. For it is not an easy thing to bear the scoffs and sneers of his neighbours for years together;—to be deemed by them infectious; and his company shunned as though he had got the plague:—for so it is with every man, in every country, that dares to break the sacred path of custom; as it is a speculation that is

very often precarious, the laurels should ever entwine round his brow when he is victorious.

(2) This is one amongst the numerous good effects this society has had on the agriculture of these kingdoms; from whence has emanated those seeds of experiment, which lead to the improvement of the civilized world.

COUNTY OF CORNWALL.

BY ROBERT FRAZER, A. M.

HORSES and oxen are generally both used for the plough throughout this county, as well as Devon; the country, very hilly, not admitting the use of carts. The horses are wanted for some carriage or other, and are almost always under the pack-saddle. The plough-team is sometimes four oxen, and sometimes only two, with always one or two horses as leaders before the oxen, with a man or boy to drive them. The plough commonly used is extremely awkward and inconvenient; the Suffolk Plough, with two horses, without a driver, is used at Trelawn and some other places, and performs double the work, and at much less expence, than the common Cornish Plough: but the farmers will not be persuaded to adopt it. The double-furrowed plough has also lately been introduced, and answers extremely well on level fields. The ploughing matches, instituted by the society of agriculture, for the formation of which the county is highly indebted to Sir William Molesworth, are well calculated to raise an emulation among the farmers in this essential article of agricultural management, in which they are in general, in this county, very deficient. It would be well if the society, or the gentlemen of the county, were to get a number of the Suffolk ploughs, or the Kentish turn-wrist ploughs, and induce the farmers, by little premiums, to use them, they would soon find the benefit of them by saving time and labour.

In the western part of Cornwall they use an immensely large plough for turning up the quartzy stones, which lie under the upper surface of the ground: Mr. Pread, of Trevetho, has a team of six or eight oxen for this purpose; Sir John Saint Aubyn, a team of fourteen oxen and seven horses, with which he ploughs to the depth of twenty, and sometimes twenty-two inches.

This had certainly much better be done by two separate instruments: one for cutting the roots of the furze and loosening the quartzy stones, and afterwards a plough to turn up the soil and stones. This operation, however, would be still more effectually done by hacking and trenching, and would be in this way in a country where, like Cornwall, there are abundance of hands accustomed to this sort of labour, performed cheaper on the whole, as it would thereby be done most effectually.

This very mode is every where pursued by the minors in cultivating their little crofts. Mr. Grosette, an intelligent farmer in the neighbourhood of Truro, has introduced the Yorkshire schim, with an improvement of his own, which throws up the weeds, and levels the ground with great expedition; and several gentlemen are adopting it. The whole of the economy at this farm is admirably simple and intelligent, and deserves to be attended to by every one in the county, who is ambitious of improving the system of farming commonly practised. Carts are not used either in Devon or Cornwall; every thing is carried on horses' backs, or on mules. The Irish car, I should apprehend, would be a great improvement to the husbandry of these counties. In the north of Ireland, where ground is as hilly as in most parts of Cornwall and Devon, a single horse will draw half a ton with ease, which is more than three of the Cornish horses carry on their backs. These Irish horses are however a much better and larger breed, and excellent in draught. In Cornwall, they keep vast numbers of little horses and mules, which, when their work is over, they turn into the common, or into fields, already eaten almost bare by other cattle, so that they are at little or no expence in keeping. They cannot be induced to try other modes of carriage. It must be remarked also, that the ascents from the sea-shore, from which they bring sand and ore-weed, are frequently extremely steep.

OBSERVATIONS.

Query. Whether small carts, with three wheels, would not be preferable for all mountainous countries, by their taking the weight off the horses' backs, and not being so liable to turn over as any other carriage.

COUNTY OF CUMBERLAND.

BY MR. JOHN BAILEY, OF CHILLINGHAM, AND MR. GEORGE CULLEY, OF FENTON, NORTHUMBERLAND.

THE plough of this county is the swing-plough, used through all the northern counties, in which we observed no improvement.

To spend time in describing the harrow, roller, &c. that have been used in almost every part of the kingdom for some centuries, would be augmenting this report to little purpose, we shall therefore hasten to

THE CARTS, through the whole of this county, are drawn by a single horse, and probably originated through necessity, from the small farmer keeping no more than one horse; in those times, simplicity and cheapness were only considered. We recollect having seen some of those TUMBLE-CARS, without one piece of iron about them; the wheels were made of three pieces of wood, joined by pins of the same material. We suppose they had the name of *tumble-cars*, from the axle being made fast in the wheels, and the whole turning or tumbling round together; but this construction has given way to the wheel with a nave, and spokes turning round a fixed axle, which is much more manageable in quick or short turns. The price of a tumble-car is five pounds, the price of the other kind seven pounds, ready for yoking.

The advantages of single-horse carts are so well understood in this county, that we did not see any other used.

Three single-horse carts are driven without any difficulty by a man or a boy, or even women and girls. Along the coast more than half the carts are driven by females, and many of these under twenty years of age, with as fine forms and complexions as ever nature bestowed on the softer sex. We cannot help saying we were disgusted at seeing them put to this employment, and especially at their riding in so awkward a manner behind the cart-saddle.

OBSERVATIONS.

I presume it will be a long time before this practice prevails in the more southern counties; and if ever it should, I hope the fair sex will ever support their claim to more delicate employment.

COUNTY OF DERBY.

BY THOMAS BROWN.

Ploughs.—Of this instrument, in Derbyshire they use several sorts: the double-plough, mounted on wheels, performing two furrows at once, drawn by three, four, and sometimes five or six horses at length in a furrow. This instrument, when well made, performs very well; but wherever it requires four or more horses and a driver, the only advantage I discovered was to the ploughman; for, in ploughing two acres, he walks only that length of ground which the ploughman, with the single-plough, does in ploughing one acre. When I saw its performance with four horses and two men, and viewed the nature of the soil, I was struck with the idea, that two of the Norfolk wheel-ploughs, two horses, and without a driver, would perform more work with the same powers, and more ease to the horses; and I believe most of the farmers that use this plough will admit, that two ploughs, with two horses in a plough, will perform more labour, and with more ease to the horses, than four horses in one of these ploughs. But they say, that for two ploughs, two drivers are necessary, and here they do with one; the advantage is gained, and the disadvantage vanishes, whenever they may adopt the Norfolk plough and manner of ploughing.—The single-plough, with two wheels, is well made, and is used here; it performs the operation well; they make them still lighter, with only one wheel.

HARROWS.—They have the common light harrows, made lighter or heavier according to the nature of the soil, and generally coupled together, each horse drawing his own harrow in the usual way; but in the Peak I saw a practice of drawing two harrows, with two horses at length, and the man leading the foremost; the awkwardness and absurdity of this practice even the man himself readily owned, but added—"It is what we are used to."

CARTS AND WAGGONS—on the common construction, are in use all over the county. In the mountainous parts they have a little light cart drawn by one horse; and here we plainly discovered the advantage of small carts, where one man going to the coal-pits with four, five, and perhaps seven or eight of these little carts, and one horse to each, will certainly bring away more weight, with less friction, and more facility, than the same number of horses could draw in one waggon. During my tour, I did not discover any instrument that is not common. The cradle-scythe, used in Hertfordshire, I think, would be an acquisition to many farmers in Derbyshire. The cradle costs two shillings, and may be mounted on the grass-scythe, which is in common use in the county of Derby.

OBSERVATIONS.

The cradle-scythe would be the most useful implement in every county, if the farmers would once get into the cleanly habit of sheafing all their corn; which I hope, as the approaching progress of agriculture towards perfection, will be universal, when our southern farmers copy this economical plan from their northern neighbours.

COUNTY OF DEVON.

BY R. F. A. M.

OBSERVATION.—No report on implements.

COUNTY OF DORSET.

BY JOHN CLARIDGE.

THE plough used here, which is called Sull, is long, large, and heavy, has one very small wheel on the side of the beam, and is constantly worked by four horses, two abreast, or six oxen in yokes; and three-quarters of a statute acre is more than is ploughed per day.

OBSERVATIONS.

The agriculture of Dorset must be at a low ebb indeed, according to this report, or the ploughs badly constructed.

COUNTY OF ESSEX.

BY MESSRS. GRIGGS.

OUR implements consist of wheel and foot-ploughs, with iron breasts, the latter only used where farming is best managed. Waggons large enough to carry two chaldron of coals, tumbrils, and small carts, with broad wheels, drawn by two horses, are thought great improvements, where earth, clay, &c. is to be carried from one part of the farm to another. Harrows and rolls, of different makes and weights, according to the land they are to be used upon.

Seed-time and harvest must necessarily be guided, in some measure, by the season; but it is usual with us to sow our wheat in October and

November; our oats and barley in March and April, and to cut them in July and August; beans are dibbed in February, and ripen in September. Our most intelligent farmers are of opinion, no substitute has yet been found out for fallows upon the strong lands; nor do they think any process is likely to be of that utility to the land, as giving it a year's rest, with good and frequent ploughings to keep it clean, and expose it thoroughly to the different seasons; this, and laying it down with good spring corn, and feeding it one year, and then breaking it up again, is, by experience, known to produce much more profit to the tenant, and less injury to the landlord, in the course of a lease, than the dishonest method of driving or over-cropping, or even the late boasted drill-husbandry can pretend to.

OBSERVATIONS.

The drill-husbandry has, however, prevailed for many years in Essex, and in some parts of the county, near the metropolis, to a considerable degree of perfection; several cultivators of large farms have, of late, began to drill to great extent, others are commencing, that time must determine, as to the probability of its general prevalence in Essex. Summer fallows making a part of the contract, in every Essex lease, the tenantry in course, however right they may be in their opinion, are still not justified by comparative experience.

COUNTY OF DURHAM.

BY JOSEPH GRANGER.

THE Rotheram Plough, harrows, and rollers, carts with two wheels, containing about twenty-four bushels, or one ton weight, drawn by three horses, and used for the purpose of leading coal, lime, dung, &c. Long carts of a good form, with two wheels also, and drawn by three horses, used for leading hay and corn in the sheaf. (1) Few waggons with four wheels used. Thrashing machines are lately introduced. Sowing machines, or the drill-husbandry, are come into frequent use: one hath been lately invented by Mr. Christopher Perkins, of Stockton, which is much approved. Mr. Perkins has also invented a harrow, for gathering couch-grass, well constructed for that purpose; and, by a peculiar contrivance, the harrows being taken from the shafts, hoes are affixed, which clean the ground in the intervals between the rows of corn sown by the drill. The price of the drill-machine is five pounds, five pounds fifteen shillings and six-pence; and the apparatus for harrowing and hoeing, four guineas.

OBSERVATIONS.

(1) I have used waggons solely for the purpose of getting in harvest; but if the farm is compact and level, there is no mode so expeditious as carts with two horses, and the driver to load and empty his own; this gives the most satisfaction to the men, and they constantly exert themselves to keep their time.

COUNTY OF GLOUCESTER.

BY GEORGE TURNER, OF DOWDESWELL.

THE waggon of this district is described by Mr. Marshall, and by him allowed to be the best in the kingdom for husbandry uses. The testimony of Mr. Drake, given to the Worcestershire surveyor, tends to confirm that idea. The carts are very good for hauling out dung, but not so well calculated for road work and other uses. The ploughs are long in the beam, with one wheel; they are rather improved in their construction of late. Four horses, or four or five oxen, the most usual draught in spring seed time, and stirring fallows generally less. It is most probable ploughs might be invented to do the work as well, with less strength; but the land in general being a tenacious loam, full of stones, is more tiresome for the cattle, and requires more strength than would seem necessary on a superficial view.

Ploughs without wheels, long in the beam, do their work well, and perhaps not much to be improved, at least during the present open field system. Ploughing in general done very well, and much improved of late years.

Waggons with six and nine-inch wheels, frequent, to haul dung; no others admitted, toll-free, through one of the turnpikes. The waggons, in general, not so lightsome as on the hills.

OBSERVATIONS.

The hauling of dung with waggons, in any county, must be a bad practice, except it is from large towns to a considerable distance.

COUNTY OF HANTS.

BY A. AND W. D.

OBSERVATION.—No report on implements.

COUNTY OF HEREFORD.

BY JOHN CLARK.

THE plough in general use is the long heavy one of the district; it contributes to the ease of the ploughman, and burthen of the cattle, by its great length. Some of the best farmers have now introduced the Shropshire light plough, some with, and others without, a wheel; it will, however, require some time to abolish the use of an implement that has been consecrated by time. The harrows are too light: the teeth should be pointed a little more forward; by their too perpendicular direction, they are apt to skim over, in place of tearing up the roots of the weeds. (1) The Herefordshire waggon is a very complete instrument; but were the wheels broader, it would contribute to the safety of the roads.

OBSERVATIONS.

(1) The pointing of the teeth forward is a mistaken idea; for by that mode they will be more liable to choak; and that they will draw firmly into the ground in a perpendicular direction, is obvious from the effects of the patent harrow.

COUNTY OF HERTFORD.

BY D. WALKER.

THE Hertfordshire plough is on a very simple construction, with one handle; the line of traction is easily adjusted; and the ploughman, while he is in the act of pulverizing the ground very finely, walks bolt upright. The ploughs of the strongest construction, for ploughing the strong flinty lands, or breaking up clover-lays, have the share and heel of one piece of wrought iron; the heel is truncated, to receive and protect the wood from friction; and the beam is thickest at and about the mortice of the coulter, where the greatest stress lies. The lighter ploughs are similar in construction, excepting as to the heel. The harrows are in general smaller than in other counties; and the waggons and carts in general light and well made.

Ploughs of various constructions, thrashing and winnowing machines, and other implements of husbandry, are introduced from time to time into this county, as well as other counties, to gratify *the whim of the moment.* (1) I applied, by letter, to the patentee of the thrashing machines, and would have annexed a drawing thereof, if I had obtained his permission.

OBSERVATIONS.

(1) *The whim of the moment!* I presume, from this opprobrious phrase, we are to understand that all attempts at improvement is the whim of the moment! What candour in this enlightened age, which perhaps might pass in the wilds of America; but I hope the genius of Britain will treat it as the caprice of the author in the moment of disappointment, or as a specimen of his abilities for the business he was employed upon.

CLYDESDALE.

BY MR. JOHN NAISMITH.

THE ploughs used here are, 1st, the Scotch plough; this is now frequently shorter in the head, stilts, and beam than formerly, and some other improvements made upon it. It is preferred for ploughing stiff land, when only one ploughing is given, as it sets up the edge of the furrows most properly, and furnishes a plentiful mould for the seed. It is generally used for the first turning of fallows, and some farmers use it for all purposes. 2d, Small's plough, sometimes with, and sometimes without, a chain. It is preferred for the after turnings of fallows; and some use no other for any purpose. 3d, A little plough, brought to this country a good many years ago, from Northumberland. It seems to be the same with that described by Lord Kaims, under the name of the Rotheram plough; and has been found to answer very well for different purposes. 4th, The Rutherglen plough. It is chiefly in that neighbourhood, for turning up the deep soil of the vallies with a strong furrow.

In heavy soils it is common to put three or four horses to the plough. Some husbandmen have made a late improvement, of making the fore and hinder horses draw from different points of the beam, so that the two lines of draught may coincide. In lands that are light and easy, or in breaking up turf with an ebb furrow, two horses, without a driver, are now frequently used. It was formerly the practice to use oxen in labour, and it is not entirely discontinued in the north-east border of the county; but as there are a pair of oxen joined to four horses, to do what the horses might perform very well alone, the oxen seem to be little better than an incumbrance. What pity that these valuable animals should be so unprofitably employed. Some gentlemen now begin to use oxen alone for all the purposes of draught. It is to be hoped that the great advantage, obvious from such experiments, will at length convince the public, and restore the ox to his ancient importance. (1)

Harrows are of different sizes, weight, and construction, according to the fancy of the owner, and the purposes for which they are intended; but it would be superfluous to give a particular description of these and other implements, which could convey no material information. (2) The carts are mostly of a plain and simple construction, at the same time light and strong. They are generally drawn by a single horse, experience having now evinced that in this way the animal is capable of the greatest execution.

OBSERVATIONS.

(1) I presume it is with draught animals as it is with implements; time, experience, and self-interest overcome prejudice, and induce the farmer to use that which is the most simple, and the best adapted to his land. Experience and impartiality soon determine the difference between mere fanciful practices, and real practical improvements. Let the advocates for oxen prove, that they can plough an acre a day, with a pair of oxen, and continue it the season through, as with horses, and the point is settled.

(2) This, I presume, has been too general an idea with the reporters; deeming it superfluous to describe the minuti of perhaps the most important articles on which they have been employed.

DUMBARTON.

BY THE REV. DAVID URE, PREACHER OF THE GOSPEL.

THE simplest, and probably the first kind of agricultural instrument in the world, is still used in Luss and Arroquhar. It is called the Highland Spade, because the Highlanders for time immemorial have made use of it in cultivating their land. This rude, but useful instrument, is a strong stick about six feet in length; the shaft is round, like the shaft of the common spade, but much thicker, and is bended a little backwards for the sake of a purchase. The head or lower part is about fourteen inches long, and from four to six broad. This is furnished with a plate of iron that covers the fore part about six or eight inches up, but behind it does not reach above two or three. The notch on which the foot is placed, in time of delving, is on the right side, and is commonly very narrow.

Spades of this construction are found to be of great utility in cultivating small pieces of ground on the declivities of hills, to which the plough cannot have access. They are used also as levers or gavelocks for removing great stones, which in many of these places are by no means unfrequent. For this purpose they answer much better than spades of any other construction. It is the common practice for eight or ten men and women to assemble with their spades for the purpose of digging a piece of ground, and it is amazing with what speed they accomplish their work. They begin at the lower extremity of the ground, and form themselves into a row at a convenient distance one from another; they cut with their spades a line into the ground, nine or ten inches deep, and then with one united effort throw over at once a furrow or piece of ground about eighteen or twenty feet in length, and eight or ten inches in breadth. Proceeding up the declivity in this manner, they do more work in the same space of time than could be done by nearly double the number of labourers, were each working separately by himself. The united strength of a few is likewise necessary for removing great stones, that frequently interrupt their progress. I know not if any other instrument of agriculture is of equal utility for accomplishing the same kind of work under the same circumstances. The Highland harrow, likewise in use here, is almost equally simple with the spade: it is composed of three bulls, two feet three inches long, two inches broad, and one and a half deep; the interval between the bulls is four inches. Each bull has seven teeth of wood. The three bars which cross the bulls have each of them five teeth; the whole length of the harrow is two feet three inches, and breadth one foot two inches, containing twenty-seven teeth. Each end is furnished with a handle, which is bent like a hoop, and is wrought with the hand, chiefly by a woman. She begins at the highest part of the ground, and goes backwards, harrowing in the seed as she goes down. A single person, with this instrument, can do more work in a given space of time than two or three men with rakes. What adds greatly to the facility of the operation is, a great part of the weight of the operator's body stooping over the harrow, so that one or two rakes or scratches with it are sufficient, especially as the seed is sown and harrowed in immediately after the ground is delved. (1)

The common Scotch plough is generally used, being found by experience to be best for a stiff clay. Many of them are so light, that they are wrought with two horses. Small's two-horse plough is likewise in use; sometimes the chain is added both to it and the Scotch. In some of them the sock is three or four cornered, for the better cutting of stiff ground. The most part have the mould-board covered with plate iron. A small plough, drawn by a single horse, is often used for potatoes; it is constructed in such a manner that the mould-board is moveable to either side of the plough. A great variety of the most approved implements of agriculture have been brought by his grace the Duke of Argyle to his estate at Roseneath, but very few of the more uncommon kinds are in general use. A drill-plough, for the turnip-husbandry, was lately brought to the farm of Barr, by John Grey, Esq. sheriff substitute of the county: he proposes to cultivate turnips to a considerable extent.

Oxen for the plough and cart are kept at Levenside and Cameron, but in no other place of the county. The practice does not seem to gain the approbation of the public.

Two-wheel carts and waggons were not, till about thirty years ago, in general use in this part of the country. An ordinary single-horse waggon for corn and hay is usually seven feet four inches in length at the bottom, but at the top it is a foot longer: it is four feet in breadth within the copes or sides, which are twenty-one inches deep, and consist of twelve pins and slotts. The bottom of the waggon is made of five bars, which are crossed with six spars, two inches separate from each other; there are, besides, two iron spars behind, with a view to prevent the copes from pressing out at the top: when the waggon is loaded they are fixed at the top with one screw and at the bottom with two. The empty waggon commonly weighs from thirty to thirty-six stone of trone weight.

A single-horse cart with a close body is commonly four feet six inches and a half in length and twenty inches in depth, at the middle of the body, but two inches deeper behind, and not so deep by one inch before. The cart-nail bores of the axletree are thirty-nine inches separate from each other. Some few carts have iron axletrees. The length of the trams or shafts before the body are generally five feet three inches, and thirty-three inches wide within; at the draught, or far-end, they are only two inches closer at the body than at the draught. By this construction there is no belly-place for the horse, which circumstance is generally believed to be greatly in favour of the horse, especially on a bad road, by preventing the trams from striking his shoulders so as to jog him from side to side. A cart of the above construction, ready for the horse, comes to about seven guineas. There are a few tumbling or coup-carts in the county; they are chiefly used in leading dung, stones, or earth, when they require to be often emptied. The wheels, either for cart or waggon, are generally fifty-two inches high, besides the rims or hoops, which are nearly two inches more.

Few places in the world can produce examples of greater draught by a single horse, on a common road, than this county and neighbourhood.

A waggon containing eighty stone of hay, at sixteen pounds to the stone, each pound containing twenty-three ounces and a half average, is an ordinary draught for one horse to Glasgow, &c. at the distance of twelve or fourteen miles: sometimes the load is one hundred stone, which is equal to at least sixteen hundred weight average. Draughts by a single horse from Leven Printfields to Glasgow, at the distance of eighteen or nineteen miles at one rake, are still greater. The waggon is commonly loaded with goods from twenty to thirty hundred weight. The same horse generally goes loaded twice a week to Glasgow and returns loaded. The waggons employed by the Printfields are covered, and consequently heavier than common waggons for hay or corn. (2)

Sledges, owing to the badness of the roads, are still used in many places of the country. Extremely few two-horse carts or waggons are to be met with here, the single-horse cart being universally, and very justly, preferred. Two carts are usually driven by one man, who walks at their side. The absurd custom for drivers to sit upon their carts or waggons, even although empty, is very little practised in the west of Scotland.

The lately invented thrashing machines, wrought by means of water or horses, have not found their way into this district. A fanner, or winnowing machine, however, is part of the furniture of almost every barn.

OBSERVATIONS.

(1) An excellent rule to put the seed in upon the fresh soil.

(2) *Quere*, Whether the dray-horse in London is able to do this with

their heavy carts? so that this extraordinary power must be derived from the lightness of the construction of the carriage, which verifies the impropriety of loading animals with superfluous matter.

COUNTY OF DUMFRIES.

BY BRYCE JOHNSON, D. D.

THE ploughs in general use are, the English plough, the old Scottish plough, and the Scottish plough with the English mould-board. The first of these is used on soils free of stones; the second in land full of stones; and the third, composed of parts of both, in soils in the medium state between these two. Of these three kinds are the soils in different districts of this county, and each of these ploughs is the most fit one for the nature of the soil in which it is used. They are made handsome, light, and with as little friction on the sole and mould-board as is consistent with a steady motion, and with the clearing of the furrow. A plough is commonly drawn by two strong horses, and one man commonly holds the plough and drives the horses by a pair of long reins. In breaking up stiff land from grass, three, or sometimes four, horses are yoked into a plough of the same construction, but of a stronger and larger make.

Light handsome carts, of a good size, drawn each by one horse, are most commonly used, as being the most profitable. In long carriage out of the farm one man drives two of these carts. The bodies or boxes of these carts are made so close as to hold dung, lime, or the finest sand; are formed to coup or turn up, in order to empty them of the loading at once, without unyoking the horse from the shafts, and when brought down again they are secured by a very simple iron locker on the forepart. When employed in carting corn, hay, straw, or any other light top-loading, a handsome, light, and large frame, called a shelving, much longer and wider than the box, is placed over, and in a very simple and effectual manner fastened to it, upon which the top-loading is built of sufficient length and breadth. Some carts, drawn by two horses, and a very few waggons, drawn by four or more horses, are used. The harrows and rollers are of a very good and simple construction. Fanners, or machines for dressing corn, by supplying the want of natural wind, of a very good construction, are common; and there are some, but only a few, thrashing machines, driven by horses. Where water can be got it is much preferable, on many accounts, to horses for that purpose.

COUNTY OF ELGIN, OR MORAY.

BY JAMES DONALDSON.

About thirty years ago the implements of husbandry used here were of the very worst construction. The wooden part of the plough did not exceed five or six shillings, exclusive of the iron, which was charged at the rate only of two shillings and sixpence. The harrow, provided only with timber teeth was valued at half a mark, Scotch, (under seven-pence sterling.) The kelloch, which was a conical basket, supported between shafts set on two ill-formed wheels, supplied the place of the dung-cart. This machine, in the structure of which no iron was employed, was, for the most part, made by the farmer himself, but, when sold in the market, cost altogether about four shillings and sixpence. These may give an idea of the implements of cultivation then in use.

Soon after this period the plough was improved into the form generally used in England, and was known by the appellation of The English Plough. Of late they are all formed on the principle of those made by Mr. Crichton, Edinburgh, and those of the late Mr. Small, at Ford, in the neighbourhood of that city, and cost from thirty to fifty shillings.

The harrow now commonly in use is also of the best construction, and costs from eight to ten shillings.

The dung-cart used on the larger farms, and on which the iron axle begins to obtain, is, excepting in few instances, drawn by two horses, and costs, when complete, from six to seven pounds.

Fanners and rollers, and the other implements of husbandry used in the southern part of the kingdom, have also been, though partially, introduced here.

Thrashing machines have been lately erected in the low part of the country: the number at present is eight.

It is worthy of remark, that Mr. Thomas Duncan, a tenant of the Earl of Moray's, on his Lordship's estate in Alves, was the first who introduced fanners into the country; and Mr. George Duncan, his son, the first who built a thrashing machine, and used the cast-iron mould-board on the plough.

COUNTY OF FIFE.

BY ROBERT BEATSON, OF PITTEADIE.

THE sort of plough used in this county is made upon the principle first introduced into Scotland by Mr. Small, at Ford. It is much lighter, and makes better work than the old-fashioned plough, and is generally drawn by two horses without a driver, except on breaking up strong, stiff, steep land, when three horses are sometimes necessary. The shape of the carts is, likewise, greatly improved, by making them not so long but broader; by this means they are easier drawn. It were to be wished that single-horse carts were more in practice, as two single-horse carts would carry a greater load, would be easier driven, better for the horses, and not so hurtful to the roads. The harrows have, likewise, undergone a very considerable improvement. Rollers, both of stone and wood, are now used; stone rollers, or rollers made of cast metal, are employed for breaking the clods of strong land, and the wooden roller for new-sown grass-seeds or turnips: these implements in point of size are conformable to the nature of the ground where they are to be used. Fanners for cleaning the grain have, of late, been much improved; they save labour. Thrashing-mills have also been introduced: these are of very different constructions; some driven by one horse, some by two, some by four, and some by water. There is one erected at Killrie, near Kinghorn, which goes by water, and thrashes and cleans at the rate of twelve bolls an hour. If the corn is dry, and in good order, many people in the neighbourhood carry their grain to be thrashed there, for which they pay sixpence per boll; they think it is much cleaner thrashed than by the flail: it is thought to be constructed upon an excellent plan; and there is a corn-mill, a barley-mill, and hoisting-tackle, all moved by the same water-wheel. By a trial lately made at this mill, it was found, there was a clear gain of one boll in twelve, which is a prodigious saving.

OBSERVATION.

A proof what a large portion of the farmer's profit is thrown away in the straw by bad thrashing.

GALLOWAY.

BY JAMES WEBSTER,

FARMER AT FOWLIS-EASTER, COUNTY OF PERTH.

IMPLEMENTS of husbandry. These formerly consisted of a plough of no very nice workmanship, and a few wooden-teethed harrows;

and the roads being perfectly inaccessible to carriages, but very few carts were to be seen, and these few little made use of. Corn was then carried everywhere on horseback, and wool was sent in the same way to Edinburgh, to be bartered for wood and iron, which also returned by the like mode of conveyance. In harvest a basket-machine was placed on horseback for carrying home the grain, and persons were employed on each side with forks to keep it in a proper poise. It is said that this practice is yet to be met with in Galloway.

The ploughs were drawn by four horses abreast, and required the attendance of three men : the business of one man was to drive; for that purpose he placed himself between the middle horse, with his face towards the plough, to guide it straight, and in this position he stepped backwards with the reins in his hands: another walked behind the horses with a checked staff, which he fastened in the point of the beam, and by means of it regulated the depth of the furrow, by raising or lowering the plough as occasion required. The ploughman followed, with a hold of the stilts; and in this formidable and ludicrous manner they repeated their attacks upon the soil.

In that part of the district called The Rinns of Galloway an excellent example is shown, by Mr. William Ross, of Stranraer, whose activity and enterprizing spirit in different branches of trade is very conspicuous. He is the first, and only person in the district, who has erected a thrashing mill, which is driven by water, and is found to answer well. A machine, invented by Mr. Craick, for sowing grain in rows, is worthy of notice : with this machine, on ground previously made fine by the harrows (excepting only on old ley) he sows every kind of grain with a third part of the seed that is commonly allowed in the country, when sown in the usual way: and the crop is always equal, if not superior, to the other, even where the same treatment is observed in every other respect. The rows are generally six inches asunder.

The value of this machine, having stood the test of thirty years, is well ascertained, and many of the farmers now adopt it in Mr. Craik's neighbourhood. It costs from six to seven pounds sterling.

A reaping-hook has lately been introduced into this country, which is considered by some to answer better than the one generally in use over Scotland. This hook is smooth on the edge like a knife, and on that account is said to cut much cleaner and easier than the other; it is also a little larger, and being apt to blunt, the reapers keep a bit of freestone in their pockets to sharp it with when occasion requires.

CARSE OF GOWRIE, IN THE COUNTY OF PERTH.

BY MR. JAMES DONALDSON,

FACTOR FOR THE HON. WILLIAM RAMSAY, MAULE OF PANMURE.

About thirty years ago the old Scotch plough was in fashion, drawn either by two horses and four oxen, or four horses and two oxen. The timber-mall, which was worked by the people on the farm, supplied the place of a roller. The dung-cart and the harrow were similar to those generally used all over the country.

The ploughs, carts, harrows, rollers, and all implements at present used in the field, are now framed on the best and most substantial construction known in the island, on which a quantity of iron is annually consumed, that would have been thought incredible, and totally impossible, by the fathers of the present husbandmen.

When the fanners, now used in every barn, were first introduced, the acquisition was deemed of the first importance; but though the inconvenience of being able to separate the grain from the chaff at pleasure has by this implement been long removed, it is only of late that any machine more powerful than the human arm was so much as thought of for separating the corn from the straw.

Although the greatest part of the implements of husbandry now in use seem to have been invented or perfected by the ingenuity of England, yet the merit of inventing the thrashing machine belongs entirely to her sister kingdom of Scotland; and George Patterson, Esquire, of Castle Huntly, was the first who introduced this great improvement into the Carse of Gowrie, in the year 1787, prior to which period the expence of thrashing on many farms from five hundred to two thousand bolls of grains had been most severely felt, owing to the difficulty of finding labourers, and the waste by imperfect or careless performance; not to mention the embezzlement in consequence of the temptations, to which the needy and the covetous are too ready to yield. By this most useful machine, to which the strength of horses or the power of the stream is applied, all those evils are entirely remedied. The whole crop is thrashed by the ordinary ploughman on the farm without interrupting their service in the field; and while the grain, by very little attention, is most completely forced from the straw, without the least degree of waste, the operation is performed in a space of time so short as to be easily subjected to the owner's eye. With all these advantages, it will not appear surprising that, notwithstanding the great expence of erecting them, thrashing-mills should now be commonly found in a district where such quantities of grain are now produced. The whole number of them at present amounts to sixty-one, and must have cost, on the whole, nearly five thousand pounds sterling in this narrow district. It is only necessary to add, that the expence, on an average, including the building of the shade, (the roof of which is in general of foreign timber) may be about eighty pounds sterling, and that from four to ten bolls of grain are thrashed in the hour.

COUNTY OF ABERDEEN.

BY JAMES ANDERSON, LL.D. &c.

ALL ploughs were drawn in Aberdeenshire, till of late, by cattle. The ordinary plough-team was eight, ten, or twelve cattle yoked two-and-two abreast, and farmers used to vie with each other, who should have the finest oxen and the greatest number in a plough ; and till this day almost all the farms that consist of a full ploughgate of land are laboured in the same manner. It is scarcely necessary to point out the absurdity of employing such a strength in the plough in a country, whose soil is so light, that, for the most part, it could be ploughed with two horses, nor can any thing be more uneconomical than this practice : for, when the small quantity of ground that is ploughed by these unwieldy teams is considered (not exceeding half an acre a day) the waste that is incurred by foul thrashing, and stealing sheaves of unthrashed corn for the cattle, a practice that universally prevails, and the impossibility of making a push by them to forward the work, when the season chances to be peculiarly favourable, it will be found to be the most expensive mode of labouring that ever was practised : and when it is farther considered, that for every ox-plough employed there is a necessity for keeping horses for driving dung, &c. to the field in carts, for carrying corn to market, and for harrowing, the total waste that is thus incurred will appear to be enormous. From these considerations, and from the impossibility of keeping ox-teams upon small farms, ploughs drawn by horses begin to prevail more and more every day ; so that it is probable that, before many years be elapsed, ox-ploughs will disappear in this county, as they have already done everywhere in the better improved districts of Scotland to the southward of it.

There is no such implement as a wain, or wheel-machine of any kind, drawn by cattle, among the old-fashioned farmers in Aberdeenshire, though some few of these have been introduced of late among modern improvers, but all loads are either carried to market on horses backs, or on carts drawn by horses: nor is it difficult to account for the origin of this practice of keeping two distinct classes of beasts of burthen. Before the roads were made no wheels could go, of course cattle could not be yoked in wains; and all burthens came then, of necessity, to be carried on horses backs, even dung for the fields: and now, that the roads are passable, horses, which were always employed for going from home with loads, continue still to be employed for the same purpose, often in carts; and cattle continue at their ordinary employment, the plough. It is thus, were we at due pains, we could trace the origin of most of the practices that are evidently absurd, many of which prevail in almost every district in Britain.

The mode of ploughing is as bad and slovenly as the team is aukward with which it is performed. The plough itself is beyond description bad, and it is of so little consequence to perpetuate the memory of what can never be imitated elsewhere, that I shall omit the description of it. I shall only observe, that it makes rather a triangular rut in the ground than a furrow, leaving the soil for the most part equally fast on both sides of it; so that, if all the loosened earth were stripped from a ploughed field, it would remain nearly in this form ΛΛΛΛΛ, only it would sometimes happen, that in some places a gap was made in these protuberances, where the soil was so stiff as not easily to give way to the plough as it went forward.

Harrowing was always performed by horses; and it was customary, and still is so, for a farmer who kept a plough of ten or twelve oxen to keep also six horses for harrowing and carriages; this is an immense expence of labouring beasts, which operates as a burthen of inconceivable weight upon the shoulders of the farmer. With a view to diminish this expence the horses were poorly kept and of little value, which by rendering them unfit for even the work that was required of them, augmented the expence. The harrows formerly were often made with wooden teeth, but now they are generally made of iron. All kinds of corn are sown broadcast. The sowing begins, as soon as the ground is dry enough to admit of it, with oats. The bear-seed closes usually about the middle of May.

In the small possessions I have had so often occasion to mention, the ploughing is universally performed without oxen. Two or three or four neighbours join to make up a plough, each furnishing one or more beasts. There are generally four or six horses yoked two abreast: sometimes a cow or two are substituted, from necessity, in the stead of horses. The miserable scratching performed by the weak creatures in these cases scarcely deserves the name of ploughing.

THRASHING.—The corns are universally thrashed out by the flail, and this work is performed by the farm-servants. It was the practice for the ploughman and his boy to thrash as much straw every day, before they went to yoke, as was sufficient to serve their team of oxen; and, as this was a considerable quantity, the practice has become very general to thrash in the winter mornings for several hours by lamp-light.

To facilitate this business the corn was, in general, very foul thrashed, and this practice of foul thrashing has thus become so general as to be a very great grievance. Some thrashing mills have been, of late, introduced into that country; and, wherever the farms are of a size sufficient to admit of it, these ought to be universally adopted, and will be found to produce a very great saving.

Winnowing is here very generally performed by letting down the corn in the wind between two barn-doors, made for that purpose, opposite to each other. This is productive of great inconvenience, and in a long track of calm weather the corn is often unavoidably spoiled for want of wind. The winnowing-machine is now coming into use, which will obviate this great inconvenience.

COUNTY OF ANGUS, OR FORFAR.

BY THE REV. MR. ROGER.

CARTS.—A man now, as formerly, derives no eminence from being the possessor of a two-horse cart. In the lower part of the county a cart, with harness for a pair of horses, may cost from nine pounds to thirteen pounds thirteen shillings. Currachs, indeed, for the carriage of corn, and creels for the carriage of peats, which may cost one pound a pair, are still in use in the remote and northern parts of the county. Ploughs, on the construction, of Mr. James Small, of Berwickshire, are often tried, and succeed on lands that are level and free from incumbrance: except in Glenisla or Glen Esk an old Scotch plough is in fact a rarity. The old Scotch plough, improved, however, with the metal boards, is in general use, and costs from one pound fifteen shillings to two pounds two shillings. Four horses are often yoked at once in a plough, but generally there are no more than two. To draw one plough in the upper part of Glenisla six small horses in a row are frequently employed, which the driver, as he goes backwards, with cautious steps and watchful eye, keeps to their labour. Many specious arguments has the ingenious Lord Kaimes, in his Gentleman Farmer, adduced to prove the superior cheapness and excellence of oxen to horses in husbandry, but few are the converts he has made to the doctrine in this county. Oxen, when old and unfit for labour, may be fattened and sold for beef at a high price; horses, when old, are useless. Oxen, when shoed and harnessed as horses, will perform all the operations of husbandry which they can perform, and are more easily supported, for they are content with straw and hay, and need no corn: but, after all, they are so slow* in their movements that he who has had experience of horses would reluctantly lay them aside for oxen.

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* The slowness and weakness of the miserable and numerous ox-teams described in these surveys, form no kind of objection to ox-labour, whatever may be the real merit of the question. We cannot argue from error and abuse against use. Perhaps neither the reporter nor his countrymen were acquainted with the qualifications of Hereford, Devon, or Glamorgan bullocks.

COUNTY OF ARGYLL.

BY JAMES ROBSON.

OBSERVATION.

THERE either are no implements used in this county, or they were deemed of such small importance in agriculture as not to be worthy an observation in this report.

COUNTY OF AYR.

BY COLONEL FULLARTON.

THE useful invention of a thrashing machine has already been introduced into the county, and is found of superior utility. The principle upon which this mill performs is by two cylinders or rollers turning quickly, and so placed as to let all the straw pass through and strip it from the grain. One of these machines, to work with two horses, may be erected for thirty or forty pounds; it may also be worked by water when there is a proper fall or power at hand. It requires the attendance of three men, and will thrash three quarters of oats per hour so clean that not one grain of corn remains upon the stalk : it enables a farmer to supply an unexpected demand, and to prevent the continual depredations to which every farmer is exposed when a number of labourers have constant access to his barn.

The more ordinary farmers still continue the old Scotch plough, which for breaking up coarse land, and working strong stony soils, is, probably, the best of all ; but it is extremely heavy, and requires four horses. In lighter and well cultivated soils a smaller plough is used, and works easily with two horses and without a driver : this mode, it is presumed, will very soon become general in the county. The Ayrshire ploughs, however, appear all too narrow in the bottom, by which it is more difficult to keep a straight direction, and to shoulder up the ridge, than with a plough broader at the bottom and bluff at the mould-board, thereby rendered steady in its progress, although not so proper for strong stony lands. Double mould-boards are used for drills and green crops, but the wheel-ploughs do not prevail in any part of Ayrshire. A two-horse plough of Mr. Small's construction, with an iron head, costs two guineas; with a wooden head, thirty shillings; cast-metal ploughs, forty shillings.

Several attempts have been made to introduce cast-metal ploughs, but they appear much heavier, and in no respects superior to those of wood well shod with iron in the ordinary mode.

The wheels of their carts are usually from forty-eight to fifty-four inches in diameter. A pair of such wheels, made of well-seasoned ash, will cost, for wood, twenty-four shillings; twelve stone of iron, fifty shillings; the body, twenty shillings; or, for a completely-mounted single cart, five pounds.

The axles are made of iron, although many carters now prefer wooden axles, as being lighter, and shaking the horses less. On the same wheels occasionally can be placed bodies of long carts for the conveyance of hay and straw. The weights drawn in this county are usually no more than from ten to twelve hundred weight, although the carriers who travel from Ayr to Edinburgh seldom take less than a ton on every single-horse cart, and the very superior practice in the neighbourhood of Glasgow sufficiently proves what may be effected. Great, however, is the amendment of the county in this respect. About forty years ago, the late Lord Cathcart, being extremely desirous of improving his estates, ordered a number of carts to be made, and given *gratis* to his tenants; but they were at that time so little accustomed to these machines, and the roads were so bad, that very few accepted of his Lordship's present.

COUNTY OF BANFF.

BY JAMES DONALDSON.

The implements of husbandry all over this district, about forty years ago, were, as may easily be supposed, very rudely constructed. In those days, creels or currocks, a semicircular basket made of twigs, and fixed one on each side of the horse by means of a kind of saddle, supplied the place of the dung-cart, and were also employed in carrying the stock of fuel from the moss. The grain, meal, and lime (of which last article from fifty to sixty thousand bolls were annually exported), were carried in sacks, on horses backs, often for ten, fifteen, and sometimes twenty miles on a stretch. The only plough used in the country was the kind now generally known by the name of the Scots Plough, and which, with the ordinary and poorer class of tenants, still retains its place, after having undergone some little improvements.

The late Earl of Findlater, about the year 1748, when he commenced his farming operations, imported ploughs, harrows, and other implements of husbandry, such as were then used in England, and in the best cultivated and most improved parts of Scotland. The other proprietors, and several of the most intelligent farmers, followed his Lordship's example, and either imported these implements of a more improved construction, or employed the tradesmen in the country to make them from the pattern of those which had been imported.

The ploughs, carts, harrows, and other implements of husbandry, on the farms occupied by the proprietors, and of those in the possession of the more intelligent and substantial tenants, are now framed nearly on the model of those used in the most improved parts of the kingdom. On some of these farms, trains, drawn by two or four oxen, and carts drawn by two horses, have of late been introduced; but, unless considerable sums are expended in repairing the roads, there is no chance that carriages of this description can come into general use.

Thrashing-mills have also been introduced of late, and the advantages of them seem to be so well known and established, that there is no doubt of their soon coming into general use. On the small farms, in the higher part of the country, the implements of husbandry are nearly the same as formerly described. The only improvement worth taking notice of is, that the creels or currocks are now generally laid aside, and small carts, suitable to the strength and size of the horses in that part of the country, have been introduced.

COUNTY OF BERWICK.

BY ALEXANDER LOWE.

THE plough most in use is the kind first introduced into Scotland, above sixty years ago, by an itinerant plough-maker of the name of Lummas or Lumbas. He made many ploughs, and left moulds for the country wrights to make others by. However, from a dislike to improvements at that period, they went totally into disuse, and no remains of them could be found about forty years ago (except in this county) but by picking up some of the moulds from old wrights. The plough was again introduced, made on a better construction, by James Small, who settled in the year 1766, and resided long in the county. He from his own genius, and the hints he got, improved it much from time to time, and it is now in general use in the county, except in some of the highland parts of Lammer-moor, where the old Scotch plough is still used. (See Small's Plough well described in his own publication on the making of husbandry utensils, and in the Gentleman Farmer; see the Scotch Plough well described in Dickson's Agriculture). It is drawn by two horses, the common strength applied to every two-horse plough in the county, except on high and banky lands, where oxen are used behind the horses.

The harrow in common use is the common harrow; in shape and use nearly the same all over Scotland. From its being drawn by one corner, and the teeth equally distant in the bulls, the inequality of its operation will appear at once from the lines drawn from the teeth parallel to the line of draught. However, as it shakes and tosses about, this fault is not so evident, except on very fine land. Many years ago, an attempt was made to improve it, by keeping the bulls at the same angle, and the teeth at equal distances on the bulls. It answered well, and every farmer who tried it liked the expedition of the operation, two horses in it doing as much work as three or four horses with the common harrow could do in the same time. It was difficult to make, did not endure much fatigue, and therefore was laid aside. Could it be made of iron, sufficiently strong and light, it would be a great saving to the farmer. Another attempt was made to improve it, which proved a useful harrow in crossing land; but on going lengthways on stiff lea, and the harrow being drawn by one point, was apt to turn about, so that the teeth in each bull came into the same track. The author of these attempts to improve the harrow (and writer of these remarks) now uses them with their bulls cross-ways, which makes an excellent harrow; but the bulls are liable to split.

The rollers in use in the county are different only in length and diameter, and in the manner of fixing the shafts to them, sometimes for two horses ahead, sometimes for two horses abreast. Some farmers have them made of stone, others of wood, and others have no rollers at all. It is not an instrument of general use in the county, nor perhaps of general utility here, as much of the land is wet.

PLOUGH FOR FORMING DRILLS FOR POTATOES, TURNIPS, &c.—When the land is well prepared by ploughing, breaking, &c. for being ridged up into drills or narrow ridges, a plough with a mould-board on each side, hung on the sheath with hinges, whereby the board can be set wider or narrower, is used for forming up the land into these ridges, from two to three feet wide. The dung is then laid into the furrows as equally as possible; from fifteen to twenty-five cart loads to the acre are used. The same plough, drawn by two horses, is brought over the field again to split or cleave the ridges; by which operation the dung is covered, and the furrows in which the dung is become the top of the ridges. These tops are then levelled by a light roller that hits the tops of two ridges at once, and to the frame of the roller is tied a drill plough, of which there are various kinds. The simplest is the best, which is a cylinder turned upon a small wheel, oftener upon two; the cylinder is a small barrel of white iron, from six to eight inches diameter, perforated with holes to let out the seed in a proper degree of thickness. When one wheel is used, it is of about eighteen inches diameter, and rolls on a thin edge on the top of the ridges, and makes a rut sufficient for the seed. A small harrow annexed to the drill follows, and moves the soil among the seeds that are dropped; and, as the horse returns by the next furrow, the opposite end of the roller rolls the ridge down, and compresses the top or sharp-pointed ridge on which the drill follows.

Where two wheels are used for the drill, they are at such distances as to take in the formed ridges between them. Sometimes the cylinder turns round with the axle, and drops the seeds, having a small coulter before to make a track for them. The harrow and roller in both cases are the same.

In other drills the cylinder does not go round, but has one hole to let out the seed, which is dropped into a funnel that conveys it to the top or track made in the ridge. The box is in a continual motion, from a crank that is moved by the spokes of the wheel. This is the best for windy weather. The former is the simplest, costing only about nine shillings. Both do well; and, among all the variety of kinds used, are the best for general use.

HOEING PLOUGH.—A small light plough of the common form, drawn by one horse, goes along one side of the ridge, and turns off the earth from the young plants, and returns by the other side for the same purpose. The hand-hoe next follows, once, twice, and sometimes thrice; it is from six to eight inches long, and at one stroke across the ridge leaves the turnips thick enough, after the hoeing is repeated two or three times, if necessary.

The double-boarded plough next follows, and turns up the earth again, on both sides, to the root of the plant. This generally finishes the turnip culture.

Carts, called close carts, for carrying lime, dung, coals, grain in sacks, &c. are about five feet ten inches long, and three feet four inches wide at bottom, the sides and fore part aslope outwards two inches and a half, as they rise to the height of sixteen inches, and generally they contain twenty-two Winchester bushels and a half. They are mounted on wheels four feet eight inches high, and drawn by two horses. Many of them do not fold up (coup) to empty the load; the frame-work of the cart being mortised into the shafts, to make them light, more compact, and firm, for long carriages.

Long carts are those used for leading home the hay, corn in the straw, wood, &c. consisting of two shafts sixteen feet long, framed together at such a width as will fit the length of the axle of the short carts, few farmers having complete sets of wheels for both kinds of carts. The body of the cart (being ten feet long) is framed with sheaths or rungs, which are bound together with what are called iron stays: they have outer side shelvings to extend their breadth for receiving the greater load; and often the whole frame-work is fixed to the shafts with screws, for the conveniency of taking off the body or framed work, to use the bottom for carrying wood, &c.

WAGGONS.—There are a few waggons in the county, used for bringing home lime, coals, &c. They cannot be of general use in the husbandry of this county, therefore a particular description of them is unnecessary. All the other implements of husbandry are much the same in kind with those used in all the improved counties in Scotland. Fanners for cleaning the corn are of the simple kind, and made by the common wrights in the country at about three pounds sterling the pair; one man to drive and one woman to fill up, and two women to riddle, can clean thirty bolls of grain in a day, being put twice through the fanners, and twice riddled.

There are several thrashing-machines in the county: one goes with the wind, others are moved by four, sometimes six horses: they are not in general use in the county, and probably never will.

WEIGHING-MACHINE.—The writer of these sheets invented a steelyard, for weighing loaded carts of hay, &c. many years ago; it is useful to all farmers having considerable concerns, and it is handy, as it is easily carried from place to place. It costs about six guineas, and, with proper care, will last many years; however, very few have been made in the county, though many of them have been sent to different parts of the kingdom, especially to the west thereof.

APPENDIX TO THE COUNTY OF BERWICK.

BY ARTHUR BRUCE.

IMPLEMENTS OF HUSBANDRY.—In addition to what is mentioned above when treating of the progress of husbandry, I am authorized to mention one circumstance respecting the plough now in general use, that attempts had been made to alter the form of the mould-board previous to Mr. Small's ingenious improvements upon the plough—He adjusted the curvature in the most perfect manner to receive the furrow with the smallest possible degree of friction—he also has the sole merit of inventing and modelling the cast-metal mould board—the chain, if it possesses any merit, is also an improvement of his harrows, rollers, winnowing-machines, or fanners—On all these he improved very much upon what had been formerly in use in the county. It would be an unnecessary waste of time here minutely to describe these implements in their past and present improved form, being so well known to every farmer here, and by others might be acquired to greater advantage, by ordering a set of such from this county, as a pattern for others.

Wheel-carriages, especially the common two-horse cart, have been essentially improved upon. The axle, formerly fitted into the wheel at random, was here adjusted by the strictest rules of art. A machine was constructed by which the axle is made to move in the nave with the least possible degree of friction. Iron axle-tree ends, for still lessening the quantity of friction, were also invented, and have since become general. Friction wheels have by sundry ingenious mechanics been attempted, but hitherto without success. The other parts of the cart were also much improved in their structure, and various alterations in the other apparatus received many useful improvements. Small four-horse waggons were at this time introduced, and very much approved for distant carriages, especially for leading lime from the Northumberland draw-kilns, these being managed by one man only.

Thrashing-machines have, though a late invention, already made great progress in the county: there are already in this county about fourteen going, and by intelligent farmers they are found useful upon large farms. They require from two to six horses, according to the quantity of grain wanted. Some are moved by a water-wheel; and one, I am informed, goes by wind.

It must be here observed, that the invention of a thrashing-machine is not new in this county. Mr. Craw, of Netherbyres, a very ingenious and learned gentleman in this county, about fifty years ago, among other projects, his active mind embraced also this useful machine for abridging labour. To a good mechanical head he possessed an uncommon degree of mathematical learning, and was in those times consulted upon all difficult matters. He fortunately also succeeded in the construction of this machine. His idea, however, went upon a different principle from that of the one in present use. In Mr. Craw's machine the effect was produced by impulse, a stroke in imitation of the flail, ten or more in succession, with incredible force, gave their blows upon the sheaves, which beat out the grain most completely; but from the number of people to attend the operation, as also the crude state of a first discovery, the thrashing-sticks, and their then misconstructed tackling, went often amiss; the business was set aside till farther improvements were made; these suggested other schemes; and this useful discovery, in such able hands, was thereby lost.

It has been suggested by some dealers in grain, also by bakers, that the principle upon which the present machine acts in the operation of thrashing by switching, in place of beating out the grain, is not so well adapted for separating it from the husk, the less ripened grains particularly, without its forcing, along with the grain of wheat, and oats especially, the husks themselves, which no art is able afterwards fully to disengage.

This objection is, perhaps, more ingenious or fanciful than real, therefore ought not to be admitted in its full latitude. The difference in point of value to the baker of the same wheat, thrashed by the flail or machine, makes the odds, they say, of two shillings and six-pence per boll worse done by the latter. There may be a little difference; but it must be allowed the thrashing machine is, upon the whole, one of the most useful improvements in modern husbandry implements.

COUNTY OF PEMBROKE.

BY CHARLES HASSALL.

THE Welch plough is in common use in Pembrokeshire, and perhaps a more awkward unmeaning tool is not to be found in any civilized country: it is not calculated to cut a furrow, but to tear it open by main force. The share is like a large wedge, the coulter comes before the point of the share sometimes, and sometimes stands above it. The earth-board is a thing never thought of, but a stick (a hedge-stake, or any thing) is fastened from the right side of the heel of the share, and extends to the hind-part of the plough; this is intended to turn the furrow, which it sometimes performs, sometimes not; so that a field ploughed with this machine looks as if a drove of swine had been moiling it. Some intelligent men in Castlemartin hundred have, however, improved this plough with success, by adding a wing or fin to the share, and an earth-board; and I have seen such work done by their ploughs as would not disgrace any country: nay, even with the common Welch-tool I have described, some of the peasants make better work than could be expected.

The harrows are badly constructed. Of late years the English Crabb Harrows have been introduced in some parts of the district: they are found to suit the soil, and it is hoped the use of them will become general.

The Welch cart is a bad one; but, owing to the general narrowness of the bye-roads, they are confined in the length of the axletree, and are obliged to make the body of the cart too long for the breadth, which is found very inconvenient in an uneven country, and can only be remedied by a general widening of the roads, through united efforts of the magistrates and land-holders. The improvement of roads must precede that of carriages.

The spades, shovels, and mattocks used in hedge and ditch-work are convenient enough, and the labourers here use them adroitly, forming their ditches in a very neat manner.

The reap-hook is a bad harvest-tool, and it would be a great advantage to workmen and their employers if the sickle were introduced instead of the hook now used.

COUNTY OF RADNOR.

BY JOHN CLARK.

IMPLEMENTS of husbandry admit of much improvement in this district: they are in general too heavy, and by that means subject the cattle to unnecessary labour. The ploughs are much too long, being from fifteen to sixteen feet, some have lately been made from ten to eleven feet; these are found to answer much better.

NORTH WALES.

BY MR. GEORGE KAY, FLINTSHIRE.

IN Flintshire there are two kinds of ploughs in general use, the Rotheram, and another, perfectly similar to the Scotch plough, with a beam of seven feet long, and otherwise in proportion. In the eastern parts and along the coast the Rotheram is the most common. A plough costs one pound eleven shillings and sixpence. The manner of working the horses in the plough is extremely awkward, and, in my opinion, very injudicious; three or four, and frequently five, being employed drawing one before the other. The horses are attached by means of an iron chain, from a yard to a yard and an half in length, fixed to the bridle or the muzzle of the plough. A particular inconvenience attending this method is, that the horses being so far from the draught cannot possibly pull with so much force as when nearer it. Besides a great deal of time is lost in turning at every end of the ridge before the plough can again be set in proper motion. The loss of time is evident from the quantity of work performed. Here little more than half an English acre is ploughed in a day; whereas in many places two horses abreast will plough more than three times that quantity without a driver, which of itself is a very great saving, but which in the former case is absolutely necessary.

HARROWS.—The harrow consists of two parts, joined by an iron chain at each end, and is composed of six bulls and three stoats. The length of the bull is from three feet three inches to three feet six, containing five teeth each, and generally from four feet six inches to five feet broad, drawn by two horses, often three, one before the other. The objection I made to this kind of harrow was, that the teeth being so close set, only smoothed the surface of the ground, instead of piercing deep enough to raise a proper mould for covering and protecting the seed. Another kind of harrow, consisting only of one part, is likewise used, but, owing to the setting of the teeth, it is liable to the same objection. They have in Flintshire no drilling instruments, that system of husbandry not having as yet been introduced. The brake-harrow and the roller are sometimes used in pulverizing the stubborn clayey soils.

WHEEL-CARRIAGES. Both waggons and carts are employed for the purpose of husbandry : the waggons are generally eleven feet in length, four feet in breadth, and two feet and an half in depth, and are drawn by four or five horses, often yoked one before the other as in the plough. The load seldom exceeds two tons, but a draught of thirty hundred weight is the most common.

The cart is about six feet in length, three in breadth, and two feet eighteen inches deep, it is very frequently drawn by three horses ; the common load is ten hundred weight. There are, however, carts of a light construction drawn by a single horse, which, when the roads are in good repair, carry sixteen hundred weight of coals to the city of Chester. Great improvements might be made in the construction of carriages ; one horse where the cart is light, with a nicely set iron axle, will do more work than three can do when it is made clumsy and with a wooden axle. A single horse in two days has drawn above thirty hundred weight from Leith to Glasgow, a distance of forty-six miles, and the road in many places very hilly. Twenty hundred weight is the common load, which is carried for twenty shillings, and the proprietors of these carriages make money in the trade.

ANGLESEY.

THE plough most commonly used is perfectly similar to that in Flintshire, and indeed in all the counties of North Wales. The length of the beam is frequently seven feet, and from the point of the sock to the after-part of the head above four feet; the other parts are in that proportion. A plough of this sort may answer very well for turning up rough, stiff, and stony lands, but in this country they are used for the most tender soil as well as the most stubborn. The great length of head, sock, and mould-board, must cause an unnecessary friction, and, therefore, more horses are required than in a plough better constructed and of smaller dimensions. But, to add still more to the draught, an iron chain is fixed to the muzzle or bridle at the point of the beam, three or four feet long, as is done in Flintshire, which is a very absurd practice. I have already mentioned that three, four, and sometimes five horses, are employed in a line, which is equally improper and injudicious. The Rotheram plough is also used by a few, but not without the bridle, and commonly the same string of horses employed. This is a very common practice throughout North Wales, and requires to be corrected.

The harrows in this island are also constructed in the same manner as those in Flintshire, consequently liable to the same objection of being too close set in the teeth: waggons and carts are also similar.

There are no drilling machines, that mode of husbandry never having been practised, not even in sowing turnips.

Fanners, or winnowing-machines, are rarely used, there being very few in this county: the corn is commonly cleaned between the barn-doors, or in the open air.

No thrashing-machines are, as yet, introduced into North Wales. Furze, or gorse, as it is called, are given to horses instead of oats: it is considered as very good food by them that use it, besides a very considerable saving. This practice, however, is not very common, as many farmers disapprove of it, thinking it makes their horses perspire a great deal, by which means they are much weakened; to prevent which some allow their horses half the ordinary quantity of oats along with it. A gorse, or furze mill, can be erected for from thirty to forty pounds. The machinery driven by water, and one man cutting and another attending the mill, can supply from twenty to twenty-five horses a day with that food.

In some instances, where there is no mill, the servants are employed to chop and bruise the gorse, and one man in a day can do as much as will serve three or four horses. Windmills are very common in Anglesey for grinding the corn, the rivers being very inconsiderable; and, from the smallness and flatness of the island, there are few water-falls.

CAERNARVONSHIRE.

THE ploughs and carriages used in this county are perfectly similar to those in Anglesey, and the land is ploughed shallow and unequal in the same manner. The harrows in both are alike. Gorse, or furze mills, are used in some part of the county. No drilling machines are used, except by Mr. Ellis. There are very few farmers in this county, and rollers are very seldom employed.

MONTGOMERYSHIRE.

I FOUND very little difference in respect to the implements of husbandry throughout North Wales, only the Rotheram plough is more generally used in some counties than in others, which is the case in

Montgomeryshire, and the harrows wider set in the teeth, which is an improvement. As to other implements of husbandry, I shall only mention, that there are no drilling machines. Three, four, and five horses are employed in a plough, and draw in a line: Oxen are also used; but, from the long carriage, they do not answer so well as horses, and, therefore, are more seldom used.

MERIONETHSHIRE.

THE ploughs, carts, harrows, &c. are the same in Merionethshire as those generally used in North Wales, and both horses and oxen are employed, and very badly managed.

DENBIGHSHIRE.

THE waggons run in general on narrow wheels. The size of the chest: length eleven feet two inches, breadth three feet eleven inches, depth two feet five inches. Carts and tumbrils in proportion.

The common length of the plough-beams is seven feet, with iron earth-boards. The harrow, drawn by two horses, is three feet six inches high, three feet six inches broad at one end, and two feet ten inches at the other.

Very few ox-teams are used: of late they have been introduced upon large farms, and are geared single, in the same manner as horses.

BRECKNOCKSHIRE.

THERE either are no implements of agriculture used in this county, or they are of such little importance, that the Reporter did not think them worthy of observation.

COUNTY OF CARDIGAN,

LOWER DISTRICT.

FROM THE COMMUNICATIONS OF THOMAS LLOYD, ESQ. AND OF THE REV. MR. TURNER.

THE ploughs are too bad for description. The carts have long and narrow bodies on low wheels, with a beam to which two oxen are yoked, preceded by two horses abreast.

COUNTY OF CARDIGAN.

UPPER DISTRICT.

THE implements of husbandry are scarcely on a par with the wretched management I have already described. The plough and cart are particularly faulty. The cradle of the plough is of unusual length, measuring, including an ill-made, blunt share, at least five feet. The mould-board is only a round piece of wood, measuring in circumference about seven inches; in working not near half the cradle touches the ground. The tail is continually held up by the ploughman by short awkward handles, and when best at work it is held in a very oblique position. The only method of setting it is by wedges. The cost of it is about fifteen shillings. With such an implement it is no wonder the furrow is not laid flat. The surface of the fallow is uneven, making, with the assistance of dung and lime, a chequered appearance of a variety of colours. A ley is a full draught for four of our beasts, a yoke of oxen, and a pair of horses, each abreast. The carts are small and heavy; the wheels in height four feet six inches. The buck in length five feet ten inches; breadth two feet ten inches; depth one foot three inches and a half: it carries about sixteen bushels, and is drawn by two oxen and two horses abreast. The track of the wheels four feet three inches in the clear. For carrying hay, straw, faggots, wood, &c. a kind of a car with a beam is used, in shape like the buck, but larger, open at each end, and not boarded. The same pair of wheels do for the buck and car; they are shifted as occasion may require. The cart, complete, costs seven pounds. The harrows and the other implements are not unlike those used in other counties. All the implements are made on the spot, and the farmer has to procure all the materials. Oxen are less used than formerly. In the neighbourhood of Aberystwith horse-carts are very common.

CARMARTHEN.

BY CHARLES HASSALL.

THE plough used in Laugharne Marsh is a most excellent one, called the Dutch plough.

A broad wing, or firm share, with a long taper point, circular traversing coulters curved, earth-board, single tail, and a sliding gauge to the beam, to regulate the depth of the furrow, with a swivel at the point of the beam to regulate the width, is a construction of plough particularly well adapted to a sandy loam, rendered sufficiently adhesive by an admixture of river slime.

The ploughmen do their work very neatly with this plough, laying up their lands and clearing their reans with singular dexterity.

Several kinds of ploughs have been introduced, but there does not seem, as yet, to be any other one that has taken a decided preference in this district; perhaps no good one has found its way hither. The light plough of Brecknockshire is used by some, and the Herefordshire, a heavier plough upon the same plan, by others.

Probably the plough used on the Shropshire-side of Montgomeryshire, and called there (to the best of my recollection) the Lomax plough, might answer better throughout this county than any others.

I have seen as neat work done with three ploughs as could be wished on lands as nearly similar to the generality of Carmarthenshire as can be imagined.

Stones are found to obstruct the ploughs of all countries, therefore the objection made by people of this district to wing share ploughs, holds good everywhere. The fact is, very little pains are bestowed by the generality of farmers in clearing of stones from their arable lands; and we often see more expence incurred by the wear and tear of ploughs and harrows, owing to stones, than would clear the land completely from those incumbrances.

The plough of this district is as awkward a thing as can be imagined, a share like a wedge, a straight stick instead of an earth-board, and altogether ill-contrived and unfit for the purposes of neat ploughing. I do not recollect to have seen anywhere such bad ploughing as is commonly observable in this and the neighbouring County of Pembroke.

Harrows.—The common harrow of the district is not better than the plough: it does not pulverize the soil without excessive labour, and going over the ground ten or twelve times in a place. I apprehend the crab-harrows of Suffolk would do the work better at three or four times going over than these do at ten or twelve, and the introduction of them may be a matter of much advantage to this district.

CARTS.—The common Welch cart is a bad one; but of late years a very excellent sort of a cart has been introduced among the farmers about Llandillo, and is getting into general use in that part of the county. The wheels are well set, so that the weight lies upon a perpendicular spoke. The body short and broad, and of a curved form, so as to give the load a tendency towards the axletree. The body answers the purposes of carrying manure, coals, &c.; and, with the addition of a thripple, it serves for carrying hay and corn. This well-contrived cart, is, I understand, getting more and more into use, and as a better sort of carriage for farm purposes in this hilly country can hardly be contrived, it is hoped the intelligent farmers in every part of the district will adopt it.

These carts are drawn by three horses, one in the shaft and two abreast, which seems to be an advantageous method of using them.

Since the introduction of turnpike-roads, the husbandmen of this county prefer using horses instead of oxen in their carts for going long distances, which they think answers better, and seems to be an improvement in the rural œconomy of this district. The old method of working two oxen and two horses in a team still prevails in most parts of the district, more or less; and in all strong work upon a farm near home, the ox seems to be a useful draught-beast.

The oxen work in a yoke in pairs, and the horses abreast before them. Some gentlemen work their oxen lengthways in harness, which is said to answer very well. But the expence of equiping an ox-team in this manner, seems to bar its being brought into general practice.

Waggons seem ill calculated for the business of farming in most parts of the county: a few are kept by gentlemen of fortune, and the carriers upon the great roads use them.

The hedging-tools are convenient enough, and the labourers work up the sod facing of the hedges very neatly. The reaping-hook is not so expeditious or so capable of making clean work as the sickle. But the former is still in common use here.

COUNTY OF HUNTINGDON.

BY THOMAS STONE.

OBSERVATIONS.

No report of implements: why omitted, the reporter can best tell. From which, however, we shall not know what is good or what is bad in this county, though it is principally an arable one.

COUNTY OF KENT.

BY MR. JOHN BOYS.

Isle of thanet implements.—The Kentish turnwrist plough is the only one known here: it consists of a beam of oak ten feet long, five inches deep and four broad, behind which is a foot five inches by three and a half, and three feet and a half long: on the top of this the handles are placed and tenoned to the end of the beam, and mortised at the bottom to the end of the chep. Through the beam, at two feet five inches distance from the foot, is a sheath of oak seven inches wide and one and a half thick, which is mortised into the chep in an oblique direction, so that the point of the share is twenty-two inches distant from the beam. The chep, to which the share is fixed, is five feet long, four inches wide, and five inches deep. The share is of hammered iron, weighs about thirty-two pounds, is twenty inches long, and from four and a half to seven inches wide at the point.

The upper end of the beam rests upon a carriage with two wheels three feet two inches high: on the axletree is a gallows, on which is a sliding bolster to let up and down. Through the centre of the axle is a clasp-iron, to which is fixed a strong chain, called a tow, that comes over the beam, so fixed, as by means of notches, or a pin called a check, to let the whole plough out a greater length from the axle, thereby letting down to a greater depth.

This implement, altogether, is most certainly a very heavy one, and from its construction must be made very stout, as otherwise either the beam or chep will break with the force of four strong horses, when it comes suddenly against a rock, or any stiff place in the soil, a hard beaten path or root of a tree, &c. With these ploughs the soil may be turned up a great depth, and laid quite flat, without any kind of furrow being left open, which is a great advantage in a dry soil. They cost, with every kind of tackle fixed for drawing them, entirely new, about five guineas each.

Harrows consist of four beams of ash, each four feet and a half long, and two inches and a half square, framed together, so as to be four foot and a half wide behind and five feet before. There are six or seven teeth of iron in each beam, which, when new, are eleven inches long, and weigh about one pound and a quarter each : one boy usually leads a pair of horses, each drawing one harrow. They cost, with a strong iron chain, called here a harrow-strap, about one guinea.

The carriages used for carrying corn to market, &c. are called hutches, drawn by four horses, generally loaded with from seven to twelve quarters of corn, according to its weight and the distance it is carried. They are thirteen feet long, are made crooked at the sides, that the width cannot be positively ascertained, but are generally three feet wide before and four behind at the bottom, and about six or eight inches wider at top and twenty deep : they are boarded at the sides and ends close enough to carry sand. If made with wooden axletrees they cost about twenty guineas, if with iron twenty-five.

The dung-carts are of various dimensions, but mostly about seven feet long and twenty inches deep, four feet broad behind, and three feet ten inches before; are usually drawn by two horses and with broad wheels, and, with every thing new and well made, cost about eight guineas.

Rolls of various sizes are used for breaking the clods: they are made nine feet long, and from fourteen to twenty-four inches in diameter, and cost from three to ten pounds.

Wheat is reaped with a toothed sickle, barley and oats are mown with a long scythe and cradle; they are then bound into sheaves with a harvest rake, being drawn together on one foot till the bundle is of size sufficient for a band, made of two lengths of the corn twisted together (1).

Horse-rakes are used for dragging together the loose barley left by the binders: they are made of oak twelve feet long, with iron teeth fourteen inches in length and five apart; the beam is cut four inches by three. These rakes are drawn by one horse, led by a boy, with a man behind, to lift it up every time it is filled with corn. Price from eighteen shillings to twenty-four shillings.

Wheat stubble-rakes are used to drag that article together, made on the same principle as the last-mentioned, but much heavier, and two feet shorter: the beam is five inches by four, drawn by two horses. Costs two pounds two shillings.

IMPLEMENTS OF HUSBANDRY IN EAST KENT.—The Kentish turnwrist plough, harrows, rolls, hutches, dung-carts, &c. with the prices of each, are the same as described in the Isle of Thanet.

ISLE OF SHEPEY.

THERE are two sorts of ploughs made use of here; the Kentish turnwrist, of a large size, with a long tow, which costs, with all tackle complete, about six pounds. This is the plough that is principally used; the other is a foot-plough, which is used in winter, on account of the stickiness of the land, when the wheel-plough will not go. The harrows are the same as in other parts of East Kent, and cost here twenty-five shillings each.

Waggons are made here to contain a chaldron and a half, and cost about twenty-seven pounds.

Carts are made of two sizes, one sort contains about thirty bushels, and costs seven pounds, the other twenty bushels, and costs about five pounds ten shillings.

WEST KENT.

THE Kentish turn-wrist plough is used with four horses on the lightest, and six on all the stiffest soils.

IT is made much stouter than in East Kent, and is drawn by a long large link called a tow, which comes from the axle to the heel of the plough. They plough from half an acre to an acre and a quarter per day in proportion to the strength of the land and the weather. The expence of a plough about five guineas.

Harrows are made with five beams, each having five teeth; they are made larger or smaller in proportion to the strength of the soil, and cost from twenty to twenty-four shillings.

Double-harrows are used, each of which require two horses; they have six beams each, with six teeth projecting ten or twelve inches from the wood, and cost fifty shillings.

Rollers of stone are used to break stiff soils drawn by six horses; they cost from twelve to fourteen pounds each.

Wooden ones of oak, from twelve to twenty inches diameter, cost from four to eight pounds.

Waggons are used to carry corn to market, and for hay, &c.; they contain a chaldron and a half of coals. If built with iron axletrees they cost thirty pounds, if with wooden ones, twenty-four pounds.

Carts hold about twenty-four bushels, and cost seven pounds: near Maidstone hutches are made to contain two chaldron of coals, and cost thirty pounds. The carts carry twenty-four bushels, and cost eight pounds eight shillings; smaller carts for one horse contain fourteen bushels, and cost five pounds five shillings.

OBSERVATIONS.

(1) An excellent mode, and might be followed by every farmer in the kingdom to advantage. It is a mistaken idea, that it is more expensive to sheaf the corn than to carry it loose. It only wants the habits of the people to make it as expeditious as their present mode. The facility of moving corn in the sheaf over that which is loose is what every farmer will admit. He then has only to calculate whether this facility does not overbalance the extra time and expence of sheafing: it will then appear very obvious that all he has to do is to induce his work-people to make use of this œconomical practice.

COUNTY OF LANCASTER.

BY JOHN HOLT,

OF WALTON, NEAR LIVERPOOL.

ABOUT thirty years ago the Rotheram, or Yorkshire plough, was introduced into the southern part of this county. The plough formerly in use was almost a load of itself for a draught-horse. In the North of Lancaster a plough, called the Cumberland plough, originating in that county, is generally used. A French plough has been lately introduced by Mr. Ducket, son of the celebrated Ducket, of Esher in Surrey.

The plough has a skim coulter, by which the surface, if foul, may be turned under, and fresh soil brought up, as it is capable of bringing up the land from six to ten inches, and is usually drawn by three horses. Another instrument has been lately introduced, which Mr. Eccleston with propriety calls the miner, which is a ploughshare fixed in a strong beam without mould-boards, and drawn by four or more horses, and follows in the furrow the plough has just made, and, without turning up the substratum, penetrates into and loosens from eight to twelve inches deeper than the plough had before gone; which operation, besides draining the land, causes the water to carry along with it any vitriolic or other noxious matter: by the substratum thus loosened the roots of plants may penetrate the deeper, and in course of time that which is but a barren substance may become fertile soil.

There are more varieties of carts in this county than in the same given space in any other part of the kingdom; in the neighbourhood of Liverpool they are a very large size: those employed in the coal trade within the town are gauged to thirty-six bushels Winchester.

The country dung-carts in the same neighbourhood are also of a very large size, and generally will hold thirty-six Winchester bushels, and carry three tons of dung: they have six-inch wheels. In the interior part of the county the carts greatly diminish in size, and have a variety of forms; in the northern part the size is very small. The clog-wheel, as it is termed (three planks of ash) formerly much in use in the north on account of cheapness, has yielded to the spoke-wheel, the clog being more clumsy and the cart more liable to overset: in these carts the wheel did not move upon the axis, but both turned round together.

Single carts are in more general use. Mr. Jenkinson, of Yealand, writes, "That a gentleman in his neighbourhood made a fair trial in the hay-field between the large and small carts, in which the latter had much the advantage in dispatch of business; and the consequence was, that the double carts were little used afterwards. Although Lancashire is not a corn county, yet, labour being dear, there are several thrashing-machines introduced, one of which belongs to Colonel Mordaunt, of Halsall, which moves by water-thrashes, and winnows and grinds (or crushes the corn for provender) all at the same time. Many of the neighbours apply to this machine, for the use of which the Colonel takes or charges one-twentieth (the average price paid for thrashing in the district.)

Hand-machines are also introduced, and are useful to the farmers; chiefly made by John Naylor, at Ashton, near St. Helens. This machine requires two men to turn, a boy or girl to feed, and another to take away the straw:

	£.	s.	d.
Hire of two men, say	0	3	4
Boy and Girl	0	2	0
£.	0	5	4

And who can with this machine thrash about thirty bushels of wheat *per* day, which would come to eleven shillings and three-pence at the present price paid for thrashing; about seventy bushels of oats *per* day, which would cost nine shillings and three-pence, according to the present price paid. But hand-machines (1) will be found insufficient for this heavy work. Mr. Henry Harper, of Bank Hall, has contracted for a thrashing-machine, to be made for forty pounds, which will require one horse, and is to thrash out from eight to ten bushels *per* hour, according to the length of the straw and quantity of grain contained. The price of the hand-machines is about six pounds each.

(2) A hay-cutter in the form of a spade, straight, and sharp at the point and upon both sides, performs the work with much more ease and expedition than the common hay-knife. This tool was introduced from Yorkshire by Mr. Eccleston.

A swing-harrow has been lately introduced, and seems coming much in vogue.

Hurdles of an improved construction merit notice; they are fastened by a wooden pin, through a strong piece of oak, in a manner so as to be loosened and removed with less trouble and less injury to the hurdle than the old forms. These were observed at Mr. Bayley's, of Hope.

Winnowing-machines of an improved construction have been introduced, and gain ground: they dispatch work briskly and save the chaff.

OBSERVATIONS.

(1) Hand-machines upon the scutching principle were never likely to be useful.

(2) The hay-cutter is an excellent tool, and worthy the attention of all hay-trussers.

COUNTY OF LEICESTER.

BY JOHN MONK.

WAGGONS.—The most common are strong and large bodied, being generally used in bringing coals and lime from some distance, and are rather preferred to the small light harvest-waggon; some people, however, think they are too heavy and clumsy. The length of the body is about fourteen feet, without any intersection to receive the wheel, consequently they are very aukward to turn. The height of the fore-wheel is about four feet nine or ten inches: the price varies from thirty to forty pounds, according to the width of the wheels. Hair-cloths are used for covering waggons, &c.

CARTS.—The carts are made upon the same principle as the waggons, large and heavy. The price is from eight to twelve pounds. The carts made use of to carry rams are very light and made for the purpose.

WINNOWING-MACHINES, &c. are made by Mr. Cort, ironmonger, Leicester, and by the few who have had them are highly commended. They are made nearly the same as Mr. Winslaw's. The price is about nine guineas. I was credibly informed that they would winnow forty quarters of corn *per* day with only four people to attend the machine.

CHAFF-CUTTER.—This instrument is likewise made from Mr. Winslaw's, and answers the purpose; but I should suppose, from the high price, it will never be brought into general use. Mr. Cort charges ten guineas.

The Rev. Mr. Babington has one of Mr. Winslaw's, which cost him about eighteen pounds, packing-case and carriage included. The Rev. Mr. Cooke attended the agricultural meeting at Leicester, and took orders for several of his patent chaff-cutters, which he has just invented, and which promise to answer every purpose: they will cost much less, and are adapted to any strength.

(1) By a gentleman, who made the experiment, I was informed that one hundred and twelve pounds of straw would produce eighteen bushels of chaff, and that one hundred and twelve pounds of hay would produce seventeen bushels.

SPRING-TEETH RAKES, sold by Mr. Cort, at sixteen shillings each. These rakes are in high repute; and it is the general opinion that one person will do more with this rake than four with the common wood-rake: they are used for both hay and corn. By the lower class of people they are called hell-rakes, on account of the great quantity of work they dispatch in a short time. Many have attempted to make these rakes, but they are far inferior to those sold by Mr. Cort. The teeth screw in, and are fastened with screw-nuts.

SPIKE-ROLLERS.—This implement is used by a few, and found to answer, especially in heavy land. The price runs from ten to sixteen pounds, according to the size and weight of iron.

HARROWS.—Square harrows are in some parts of the county used with tine, about nine inches asunder, and two triangular harrows drawn together by the acute angle; so that their respective hypothenuse form the diagonal of a square. I also met with a harrow, the tines of which were sharp like a coulter, and screwed in that they might be taken out to sharpen.

OBSERVATION.

(1) These chaff-cutters answered one very good purpose; that is, by shewing the public the advantage that would be derived from a machine for that purpose, when brought to perfection upon a good principle. But it should always be observed by every mechanic, that, after a ma-

chine has been constructed upon a bad principle, and has been tried various ways, without accomplishing the desired effect, it then ought to be abandoned, and a better principle sought for.

COUNTY OF LINCOLN.

BY T. STONE.

IMPLEMENTS.—The ploughs here used are of the Dutch sort, not ill adapted for this kind of land, except that they carry too wide a furrow, being too wide and too long in their bottoms, which accounts for the fen-men ploughing over so much land as two acres *per* day. A plough made in a similar way to the Norfolk plough would probably best answer upon this land, on account of its being occasionally set to an equality of depth, independent of the ploughman's constant exertion, which is not the case with the Dutch plough.

Low waggons are substituted for carts, the sides of which are made to take out or fall down, as occasion shall require them, to deposit the contents or receive their loads, and this mode of conveying the requisites upon a farm may answer as well as carts. All the other implements are in the common way, and need no particular description. (1)

OBSERVATION.

(1) This has been too prevalent an observation by the reporters to the board. It would have been desirable for them to have given a full description of the implements of every county: by such a description probably some useful knowledge might have been gained, since the agriculturist would have selected the good from the bad.

COUNTY OF MIDDLESEX.

BY PETER FOOT.

THE common wooden swing-plough is in the most general use in the county of Middlesex. The Hertfordshire wheel-plough is also used by some farmers for summer fallowing.

Harrows of various weights. A pair from the draught of one to four horses, with rollers of wood and iron, of equal capacity, are made use of.

There are but few waggons used, and the carts mostly in use are the six-inch wheeled shooting-carts, with iron arms of various sizes for their axis. These carts, with the addition of moveable head and tail ladders, carry hay, corn, &c.; and when thus enlarged are found more convenient in the farming business than waggons, they being less expensive, and standing in less space when out of use.

OBSERVATION.

It is rather singular that the metropolitan county should be behind in the improvement of their implements, where the greatest riches and knowledge of the kingdom centre.

COUNTY OF MONMOUTH.

BY JOHN FOX.

THE common country plough is in general use, as are carts with two wheels, and common drags and harrows drawn by oxen and horses, one or two horses frequently going before the oxen to plough, &c. Sometimes four or six oxen are made use of to plough or draw waggons upon the roads, to carry corn to market, bring coals, &c.

COUNTY OF NORTHAMPTON.

BY J. DONALDSON, OF DUNDEE.

THE waggons, carts, rollers, and other implements of husbandry, are so similar to those in use in the neighbouring counties, and which have been fully described in some of these reports, particularly in that of Leicester, that it is deemed unnecessary to fill up this report with what would have so much the appearance of repetition.

The principal implement, the plough, is a clumsy piece of work, with a long massy beam, and an ill-formed timber mould-board, better adapted as a machine for four or five horses to pull along than for the purpose of turning a neat clean furrow: and it cannot admit of a doubt, but that, with a well-constructed light plough, with a cast-iron mould-board (such as are common in many parts of England and Scotland) a man with two horses abreast, and without a driver, would do as much, and to better purpose, than is here done by a man and a boy with three, four, or five horses: indeed by the practice of the county this is clearly admitted, as a double-furrow plough, of a similar construction with the other, is pretty generally used, and which does double work with the same number of horses.

OBSERVATION.

No county in the British dominions is making a more rapid progress in the improvement of their implements than this.

CENTRAL HIGHLANDS OF SCOTLAND.

BY MR. MARSHALL.

THE implements of the Highlands are still simple and rude: even the plough, though now worked with two horses, has not yet acquired its modern form, at least not universally; among tenants it appears, however, to be daily growing into use.

An implement still more rude and simple than the highland plough is the sliding cart on slips, which for the work of harvest is now in common use. It is formed of two long poles framed together shaftwise; the smaller ends are fastened to the hames in the manner of other shafts, the larger ends sliding upon the ground.

From this simplest of implements the present rude cart of the highlands may still be traced (especially in the north of Scotland) through the several intervening stages; and in the present one-horse cart of the lowlands, it may be said to have reached its ultimate improvement.

The waggon, or four-wheeled carriage of burden, is unknown in the highlands, yet it is peculiarly adapted to a hilly country. In the moorlands of Yorkshire, a country very much resembling the highlands of Scotland, there is not, generally speaking, a cart which is not considered as an aukward and worthless implement among steep roads, being distressing to the shaft-horse in going up as well as in coming down a hill.

COUNTY OF CROMARTY.

SMALL'S chain-plough, with the curved mould-board, and the feathered as well as common sock, is now mostly used, not only by proprietors and principal farmers, but by some of the common tenants, who find that it is easier drawn, and turns the furrow neater than the old Scotch plough, which, however, is still the plough used by the greater number of the tenantry. For strong rough stony grounds a heavier plough, but well constructed and proportioned, is in use with several gentlemen and farmers also without the chain, the share by its construction answering the purposes of both head and sock. This plough is preferred in lands of the above description, as being more solid and steady, and not so apt to start out of its course on meeting obstructions.

The Carron curved iron-mould boards are now coming rapidly into use. In respect to the implements used by the tenantry in general, they are indeed but a miserable imitation of the approved instruments, or utensils of husbandry, are of a diminutive size, suited perhaps to their strength of cattle, but constructed without any sort of regard either to design or proportion.

The wheel, the trench, and a variety of other ploughs, were introduced about twenty or thirty years ago by the late Sir George Munro, of Poyntzfield, and Mr. Ross, of Cromarty, but did not answer expectation.

The harrows are of the ordinary form, used to the southward with twenty iron teeth, about six inches long, clear of the wood; size of the harrow four and a half feet long by four feet broad. The break harrow is not much used, but as fallowing comes more into practice, these will come more into use.

Wooden and stone rollers of various kinds are used by proprietors and principal farmers, but by few, if any, of the small tenants, which is a great loss, especially to such as have light and sandy soils.

COUNTY OF ROSS.

The light kind of Scotch plough, which does the work very imperfectly (with the irons it will not cost above six or eight shillings) is the one made use of by the smaller tenants. Their carts consist of a small frame, with shafts set upon tumbler wheels, two feet high, on which they place a basket called a kellach, which will not contain above two Winchester bushels. Their other implements are of similar value and quality. Those on the farms of gentlemen and the better sort of farmers are equal to any in the south. Both horses and oxen are used, the latter by the poorer sort, who in general yoke from six to eight oxen, or four horses, in a plough. Two horses without a driver are found sufficient by the more intelligent farmers.

ORKNEY ISLES.

THE Scotch plough of a small size is in common use. A plough of a very peculiar construction, with one stilt, without either ground wrist or earth board, was the only instrument of tillage in these islands a century ago, and still continues in common use. In some parishes, in shallow or rocky ground, it is found to answer better, as it is a much cheaper instrument than the other, to which, nevertheless, it is now generally giving place. Small two wheel box carts are in common use, drawn by two oxen, or one horse. The common harrows are very small and light, often with wooden teeth, even where the soil is strongest. The roller is little used, and not at all by the smaller farmers.

CONCLUDING OBSERVATIONS

ON THE

IMPLEMENTS OF THE NORTH.

IT is certain that the greater part of the implements of husbandry used in the North might be much improved, and where extensive farms in tillage are to be found, there is no instrument that can be more advantageously adopted than the thrashing mill. The Reverend Mr. Mackay, of Reay, has transmitted to the board the model of an ingenious instrument of this sort of his own invention, and another is promised by Mr. Munro, of Delnz. The importance of this discovery to the public has never yet been sufficiently explained. According to an experiment made by Mr. Beatson, of Kilric, in Fife, there is an addition of one in twelve, when grain is thrashed in a mill, properly constructed, instead of being done by the flail.

What an object in a national point of view! It was supposed that we could not supply ourselves with bread without the harvest of America, and behold! we have nothing to do but to thrash the grain we now raise thoroughly, and the business is done, and more.

It may be proper to add, that, besides the loss of grain, thrashing with the flail is a very unwholesome occupation, (from the quantity of dust perpetually flying about,) and that those who make thrashing a constant occupation, are never healthy, and seldom live long. Of what consequence therefore is it, not only to increase the quantity of grain, but to render an unhealthy occupation unnecessary. Some intelligent persons imagine that the same machinery might be made use of for grinding as well as thrashing corn. In that event there would be sufficient occupation for those now employed in thrashing in other branches connected with the manufacture of grain.

GENERAL OBSERVATIONS ON THE REPORTS.

The Board of Agriculture, with the best intentions for the public good, appointed surveyors to travel through the different counties, and make observations, and communicate to them the different practices in agriculture, with a view to be recorded for general information: but it will be seen by these extracts, that the reports on implements have been the most fully and best described, by those gentlemen who resided in, or near the county reported, such, from their practical knowledge, being more capable of describing the usages of their own neighbourhood, than men riding for a few days through a county with whose customs they were unacquainted. The views of the board would have been more accelerated had their choice fallen on men whose practical knowledge in agriculture had rendered them eligible to give a report on their own county. Their mass of information would then have been more useful to the practical farmer. He might then have received that knowledge by his own fire side, which he could not by any other means have acquired, and on no particular would he have been so much interested, as in a full and accurate description of the implements used in the different counties, with their progressional improvements: from which he probably might, from a combination of the whole, receive some useful hint beneficial to himself and his neighbours. For the liberality of the mind of the English Farmer is such, that he only wants demonstration of facts. The moment he is fully convinced of the superiority of any mode over that which he has been accustomed to, he immediately adopts it, according to his best information. Quere, whether it might not have been more conducive to the agricultural interest of this country, had the board collected a specimen of all the different implements, and therewith formed one public depot, judiciously arranged, with proper persons appointed to describe them, and permission for any applicant to take drawings, and make what observation he pleased? By which means a more rapid and universal knowledge of improvements would be circulated through the country.

Having made the implements of agriculture my chief study through life, by which I have been enabled to make improvements on some of the most important ones, which when made public, by the assistance of a printed description, may probably add something to the increasing knowledge of farming; to shew the progression of improvement on the implements of the different counties, I have selected the principal part of what has been written on this important subject by the reporters to the board, bringing into one view all the information I could procure, in order to precede a description of my improved implements and machines down to the present day.

First. The patent harrow will be fully described in an Essay addressed to the Board of Agriculture, on the bringing pasture land into tillage, and returning the same to grass without injury.

PARTICULARS OF A PLAN

FOR A

GENERAL DEPOT OF IMPROVED IMPLEMENTS IN HUSBANDRY.

MY LORD AND GENTLEMEN,

HAVING duly considered the hint thrown out by the author of the Farmer's Calendar, in the fourth edition of that work, and by that worthy gentleman, Mr. Nicholls, at Lord Somerville's public dinner, at the Freemasons' Tavern, on the propriety of establishing a depot or depots of implements in agriculture, and having for several years made it my principal study to improve implements and machines for the abridgment of labour in husbandry, (how far I have succeeded, the public are the best judges.)

I beg leave to inform the noble lords and gentlemen cultivators of this country, that I do intend to open and establish a depot of the most improved implements in agriculture in some eligible situation in London upon the following plan.

First. To exhibit the most improved implements of the British empire.

Second. To sell by commission all the improved implements that I can procure, that are not made in my manufactory.

Third. To give gentlemen the best information that can be obtained, where they may procure the most improved implements at the least expence.

Fourth. To offer no implement or machine in agriculture for sale, but what has received the fullest testimony of its utility and improvement, by respectable certificates from gentlemen in the neighbourhood where they have been in full work, for a time sufficient to prove that they are the best known for their respective purposes in that country.

Fifth. The certificates to be fully entered in a public book to be inspected by any gentleman, free of expence.

And, Sixthly. A proper person to be appointed to superintend the depot, one who is well acquainted with practical agriculture, both in the old and new husbandry. The mechanical department I shall superintend myself.

This, my lords and gentlemen, I intend to establish with no other view of remuneration than yours and the public patronage.

I am,
Your most humble, and obedient Servant,
W. LESTER.

ESSAY

ON

The best Means of converting Pasture Land into Tillage, and returning the same to Grass, without Injury to the Land.

ADDRESSED TO THE HONOURABLE BOARD OF AGRICULTURE.

MY LORDS AND GENTLEMEN,

THE best means of converting certain portions of grass land into tillage, without exhausting the soil, and of returning the same to grass after a certain period, in an improved state, or at least without injury, depends much upon the nature of the subsoil of such lands, which I shall endeavour to explain to the board, partly from practice or actual experiment, and partly from accurate observation.

I some years ago occupied a farm upon the borders of Charley Forest, in the county of Leicester, a considerable part of which had been a rabbit warren, the subsoil a deep red sand upon a sandstone rock. My course of cropping as follows: first ploughed up the turf and harrowed in wheat, after wheat fallow for turnips, after turnips barley, with a certain quantity of grass seeds per acre; that is eight pounds of broad clover, six pounds of Dutch, six pounds of trefoin, and two bushels of ray grass, sown immediately after the barley, and harrowed in with a light harrow drawn by one horse; in the winter following I manured the seeds with rotten dung, about fifteen cart loads *per* acre, and never suffered any kind of stock to graze upon them before they have been once cut, either for soiling or hay. I have known many a piece of young seeds injured very much by being grazed too early. I cut for hay the first year, and grazed the second, then plough up and harrow in wheat upon the clover lay, and continue the above rotation of cropping. I rarely ever knew (though I have more than once made the experiment) that kind of soil to pay for laying down to grass more than two years. The land, in its warren state, was not worth five shillings *per* acre, but by the above mode of culture was made worth twenty-five; this course of cropping is in my opinion, the most profitable to the farmer upon all convertable soils.

I have, for the last fifteen years, occupied a considerable farm at Yardley Hastings, in the county of Northampton, the subsoil of which is a strong retentive yellow clay, with small flints interspersed. The field was inclosed in 1777, and then was noted for bearing good wheat and beans, though the surface mould is not more than four or five inches deep. A part of my farm had been laid down to grass at the time of the inclosure, and I presume might have produced very good crops of seeds for the first two years, but ever after had not kept more than one sheep to the acre, but still kept to graze, under the idea that time would do that which the hand of art could not do, that is, by meliorating the soil to produce a useful and luxuriant grass.

I know at this very time a great many thousand acres in the counties of Northampton, Huntingdon, Cambridge, Bedford, and Buckingham, under the same ruinous system, and in many cases where the landlord has been so egregiously mistaken as to suffer several tenants, which otherways might have been useful, to fail under him, before he would give up his darling idea of having rich grazing land, without even considering whether his subsoil was congenial to grass. It is well known that these counties are noted for producing large quantities of wheat, but such circumstance does not imply that the land which will bear wheat will also bear grass to feed an ox. Such experiments as these upon large scales do not only injure individuals that try them, but the public at large, by withholding from them the produce of the right use of the land. This I presume is not one of the least causes of the present scarcity, by keeping down so much of the land that has been inclosed within the last twenty years in this unprofitable state, which has prevented us from having a stock of wheat in hand sufficient to meet a few unfavourable seasons.

Time, and a couple of productive harvests, in no small degree verify this observation.

In my opinion, all lands, the subsoil of which is not congenial to grass, that have been laid down within the last twenty years, should be brought into immediate tillage, as they would bear grain of the best quality, and the least injure the grazing system. Some useful information in bringing grass land into tillage may, I flatter myself, be gained from the following experiments. It is a custom in breaking up land (the subsoil of which is a retentive clay) that has been laid down to grass some years, to begin to plough it early in the winter (if the season will admit) for a spring crop, with an expectation that the frost will make the land fall the better under the harrow, and that more soil will be obtained to cover the seed; likewise, that the work will be more forward in the spring, the harrowing in of seed corn upon such land requiring nearly as much labour as the ploughing.

I have repeatedly found the above custom to be wrong, and very injurious to the crop. The farmer is getting rid of a part of his labour, and doing the rest when he thinks he has the best opportunity, but still he is losing the greatest part of his profits, and consequently had better let his team lie still than to plough his land unseasonably.

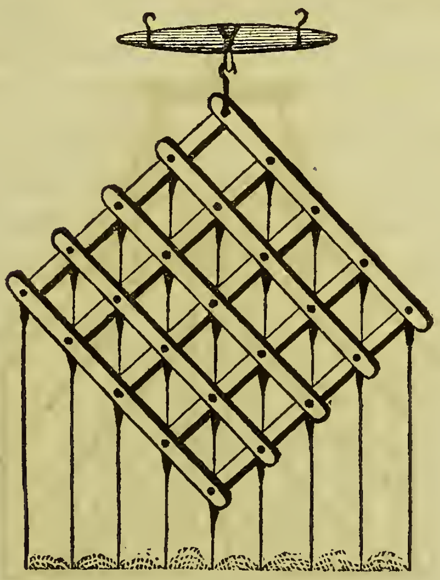
Having about one hundred and twenty acres of my farm down to grass, some of which had been laid down eight, some ten, and some twelve years, it being in a poor, unprofitable state, not producing much more than would pay the poor rates. I tried a variety of top dressings, but found that if I had an inexhaustible mine of dung, I could not in anyways alter the subsoil, it being so retentive of water, as always to throw up a coarse, short, and poor grass. Fortunately having the liberty in my lease to convert into tillage all such land as had been ploughed in the open field state, I therefore began, according to custom, to plough up in the early part of winter a field of about eighteen acres, the season then being favourable; but before I had finished, the frost set in, and prevented me from ploughing any more till the spring. When I had done the greatest part of my spring seeding, I ploughed up the rest, and sowed the whole eighteen acres with oats. I found a much greater difficulty in covering the seed upon the land that had been recently ploughed, it requiring much more harrowing than that land which had been ploughed before the frost; and, at the last, a considerable quantity of the seed was left uncovered, and exposed to the fowls of the air. Besides I was put to an extra expence, in collecting and turning back the turfs, that had been pulled up and turned over, by drawing the harrows obliquely across the furrows to break off their sharp edges, with a view to raise more soil to cover the seed.

But at harvest, the crop on that land sown immediately after the plough was much more promising, clean, and luxuriant, than that upon the land ploughed before the frost. This induced me to keep the crops apart, and thrash them separate, when I found twelve bushels more *per* acre on that land that was ploughed in the spring, than on the other; which considerably overpaid my extra expence of harrowing and turfing. The land was of the same quality, and the same quantity of seed was sown *per* acre, and all in the space of ten days; but the seed that grew upon the land that produced the best crop was considerably the least, owing to so large a portion of it being left uncovered. I therefore concluded that the land that was ploughed early in the winter, had not only received the mollifying power of the frost to facilitate its harrowing in the spring, but that it had, at the same time, absorbed and retained a certain portion of water, which its fine powdered surface prevented from evaporating in the spring, so that the seed was sown or laid in upon a cold stark bed; whereas the seed sown immediately after the plough, is laid in a light, warm, pliant bed, ready to receive all the fructifying powers of the atmosphere. That this was the case I have since very accurately proved.

Early in the next winter I ploughed up a small piece of another field, by way of experiment, that had been laid down to grass eight years, the remainder of which I ploughed in March following, and sewed immediately with oats. The land ploughed before winter, and the fresh ploughed land adjoining, I sowed on the same day, that there should be no difference in that way. The land that had the frost upon it did not cost me half so much in harrowing and turfing as that which was sown immediately after the plough ; but at harvest the crop, as before, was so superior as to be much more than a compensation for every extra expence.

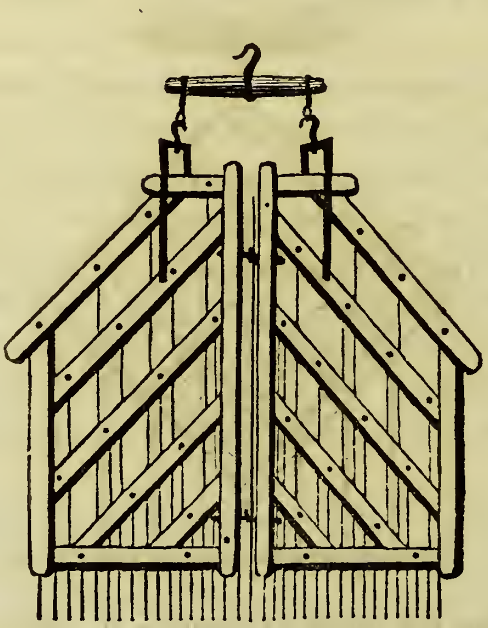
I at this time began to examine minutely into the principle and construction of the harrow, stimulated thereto by the above experiments. I found, by repeated observation, that after going four or five times over the land lengthways, with the harrows, the greatest portion of the ridges or sharp edges of the furrows were left untouched, by the aptitude of the greatest part of the tines to work in the same track, in the cavities betwixt them, and consequently not raising a sufficient quantity of soil to cover the seed, without being under the disagreeable necessity of drawing the harrows across the furrows, by which means a large quantity of the turf is pulled over and laid the grass side uppermost, exposing the seed in some parts, while it covers it in others. The turfs must be collected, or turned back again by the hand at a considerable expence, or the grass will grow up to the injury of the corn.

This figure represents a drawing of the common harrow in the Midland counties, with the track of its tines, and the impression it leaves upon the land.



I first tried to alter the mode of drawing it, with a view to diversify the track of the tines, so that one tine should not be drawn in the same track with another. This I found not to answer my purpose; I then tried a new, and, as I then thought a judicious, arrangement of the tines. This also failing, I condemned the form of the implement to be bad, as not being calculated to admit of a proper arrangement of tines to make a complete good harrow; I then tried various modified forms, at a considerable expence, and at last I happened upon a form that would admit of an arrangement of tines, so as to make a complete harrow to answer every purpose I desired.

The following figure represents this complete implement, with the track of each tine respectively described, and the impression it leaves upon the land, which unites within itself all the following good qualities, so requisite and desirable in a harrow.



First. That its tines are placed in that position, that each tine shall make one respective track upon the soil, and those tracks at equal distances from each other, yet so near together as to move the whole of the soil upon the surface in whatever state the land may be in, when the harrow is required, and that at once drawing over; at the same time the tines stand in that position, and at that distance from each other, as to prevent its choking, or driving the soil in any state on heaps, and that it never requires lifting up to free it from couch, or any other impediment that may lie upon the land, if the proper size be used; likewise it may be drawn in such position as to prevent any obliquity in its motion, or any possibility of one track being made in the track of another; nor is it liable to be turned over by the horses running away, or turning too short; but is proper to harrow small as well as large lands, couching and yielding to ridge and furrow, and all inequalities of the soil.

The use of this implement will entirely do away the necessity of that absurd custom of driving the harrows as we drive a post chaise, by mounting the boy upon one horse to drive, the other upon the trot, on purpose that they may jump about to free themselves of couch, or diversify the tracks of their tines, by their zigzag motion, a custom that must entirely cease, when brought to the test of comparative experiment; and why not enquire into the mechanical construction and motion of that common, though useful implement, the harrow, when we must all admit how much we are indebted to the mechanic arts for most of the comforts of civilized life?

The common harrow, when drawn with great velocity, zigzags or jumps about; that is, the right and left corners act as pivots or centers alternately; first one corner strikes deep into the soil, throwing the other nearly above it, and *vice versa*; so that the soil is very partially moved: whereas had it one steady uniform motion, with the tines placed so that no one can be drawn in the track of another, as in my harrow, all the soil would be moved effectually.

Having obtained my desired object, I ploughed up no more land, with a view for the frost to assist me in harrowing of it. I ploughed twenty acres the next spring, that had been down to grass for ten years, and sowed the whole with oats. On nineteen acres I sowed four bushels to the acre, and harrowed them in with the new harrow. On the other acre I sowed five bushels, and harrowed them in with the common harrow, by way of experiment. The nineteen acres were much better harrowed at three times over, than the one acre was at six lengthways, and once across; besides, I was at no expence in turfing the nineteen acres, but at a considerable one with the one acre, and at harvest the nineteen acres were considerably the best crop, though one bushel to the acre less seed sown.

The above experiments have fully confirmed me in this observation, that there is a time for putting the seed in the ground, in which the land will work the kindest, that is betwixt too wet and too dry, and that in the farmers taking the advantage of this happy moment, very often the quality of their crop depends. What can more fully prove the value and advantage of the abridgment of labour at this important season?

I am, my Lords and Gentlemen, very confident, not only from my own experience, and the observations I have made upon the construction of harrows in various parts of this kingdom, but from the opinions of some of the first agricultural characters of the present day, that there are very few farmers in this country, if they knew the good effects of my improved harrows, who would continue to use any other; and that if universally used, they would save nearly one hundred thousand quarters of seed corn every year, besides a quantity of labour beyond my powers of calculation.

My course of cropping at Yardley Hastings.

First. Oats upon turf.

Second. Beans.

Third. Summer fallow for wheat, on the wheat sowed twenty pounds of broad clover seed *per* acre, harrowed in with a light harrow, drawn by one horse.

Fourth. Cut the clover for hay first crop, graze with sheep the second.

Fifth. Graze with sheep.

Sixth. Wheat on the clover lay.

And, Seventh. Beans.

The clover maintains a large flock of sheep for the fold; never let that kind of soil lie to grass seeds more than two years.

I know many farmers that have tried to graze land of a similar subsoil, but they found it would not answer, and have got into the above mode of culture, those that have had liberty to plough; but, unfortunately, those are few; for, in fact, the tenant has been possessed of the mania of grazing, as well as his landlord, and several have failed in the attempt, by keeping their lands down longer than two years, without knowing whether their subsoil was congenial to grass. This is the most disagreeable misfortune of enclosing these kind of soils.

To obtain cattle crops from such lands is very precarious; I believe potatoes are the only crop to be got to advantage, and those not in all seasons. I have tried cabbages, turnips, and cole-seed, but they did not answer. In the year 1796, in the latter end of the month of April, and the beginning of May, I fallowed twenty acres of land that had been beans the year before; at the latter end of May I had it ploughed a second time, and broke it down by harrowing and rolling to a fine tilth; I then manured it with about fourteen loads of dung to the acre. On the fourteenth of June, I began to plant it with potatoes, and planted the whole twenty acres in ten days, with six horses and two ploughs, four men and fourteen boys; that is, two men and seven boys to a plough, planting every furrow, so that six boys, with one man, to look after them, laid the sets in the furrow, putting them under the loose soil, with their thumbs, out of the way of the horses, the team passing them at each end of the land, so the boys and the teams were kept constantly at work. The man and the boys cut the potatoes in the afternoon for the next days planting. The whole expence of planting and cutting the seed was four shillings and sixpence *per* acre, exclusive of the ploughing, which I counted nothing, for the land must have been laid up for wheat. I horse-hoed once, and hand-hoed once, at the expence of eight shillings *per* acre; I got them up with the plough, at the expence of twelve shillings *per* acre, and had upon an average one hundred and thirty bushels *per* acre, planted $\frac{16}{114}$ bushels. The autumn was fine, I sowed the whole piece with wheat, and never had a finer crop. The next year I planted six acres of potatoes by the same mode of culture, but the autumn was wet, so that I could not get them off to sow wheat, and they spoiled the land for a barley crop; I therefore laid by planting potatoes. The practice is undoubtedly good where the subsoil is not too retentive of water.

There is a considerable quantity of old pasture land, the subsoil of which corresponds with the above described, which is called in some counties woodland land, and bears a poor indifferent grass, only fit for store cattle, or the dairy. How far it may be proper to bring such land into tillage I cannot say; this I well know, that upon farms where there is no ploughed land, a portion might be ploughed, and by cutting the straw produced into chaff with hay, the farms would keep as much, or more cattle than they do in their present state, and the corn produced would be clear to the public. The best mode of cultivating those soils for the most immediate profit, is, by paring and burning, by which means they may be sowed with wheat the first year, of which they are incapable, with propriety, by any other mode; the greatest misfortune is, such soils, when ploughed for three or four years, are so difficult to lay down again to grass, they being so spongy and hollow throughout the roots, before they can form a turf; for that reason I would not plough up more than I intended to keep in tillage.

In my opinion, these soils should be touched with caution, though a small portion of them might be ploughed to advantage. They produce a large bulk of straw, but the corn is mostly thin and light, and sold in the Midland counties, principally for seed, under the name of Newland corn.

The case is quite different with the old ploughed land, that has been laid down to grass for ten or fifteen years, that bears bold heavy corn of a good quality, the first year; and, if I may be excused the observation, these are the lands that should be brought into immediate tillage, as the most conducive to public benefit, for they had much better be covered with corn than with their present useless mosses.

I am well convinced, from my observations in various counties, there is much land of this description that pays little to the public, and less to the occupier by far, than it might do, by a different mode of treatment.

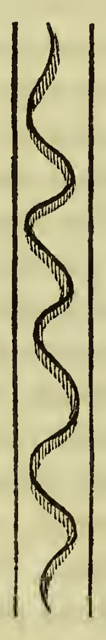
That kind of pasture, the subsoil of which is a deep rich loam upon a stratum of gravel, and in many cases where the surface is covered with banks, if we could spare it from grazing, is certainly the most productive land to bring into tillage, to crop for three or four years, with a view to lay down again to pasture. This is our best corn bearing land, and will graze immediately after the plough. This is the land on which the tenant could afford to pay the landlord something handsome *per* acre for the privilege of ploughing, wherein he runs no hazard; for if he ploughs, and corn sells low, he can turn his land again into grass whenever he pleases; there is some land of this description that would be better for ploughing for a few years, that its surface might be levelled and then returned to pasture.

If the lease is nearly expired, it would be proper for the landlord to find the grass seeds, but if it has some considerable time to run, it will be the tenant's interest to sow a proper quantity of seed *per* acre, and of a good quality. The seeds may be sown upon either wheat or barley, provided they be harrowed in with a light harrow, and that the land has been fallowed the year before, but it should not be manured in its fallowed state. To prevent the crop being too large the succeeding year, that it may not lodge and destroy the seeds, the dung should be reserved to top dress the young seeds, which should not be grazed before they have been once cut for hay. The seeds proper to be sown for pasture, eight pounds of Dutch, six pounds of broad clover, four pounds of trefoin, and one bushel of ryegrass *per* acre; the clover should be free from dock, and the ryegrass from couch seed.

If it should be deemed necessary to break up our rich old pastures, before our wastes can be brought into a state of cultivation, particular care should be had with regard to the nature of their subsoil, and, if possible, to avoid touching those whose subsoil is a retentive clay, as not so convertible on all seasons.

With regard to draining, there can be but one idea on that valuable improvement, that is, to draw off all superfluous waters, wherever they may be found. Much has been done, highly to the credit of some of our countrymen, and there is much more to do. As to the mode of doing, it has hitherto depended upon situation and circumstances. My idea is, that all drains should terminate at the bottom in an angle of forty-five degrees, as the best calculated form to prevent them silting up.

Suppose this figure to represent the bottom of a drain made after the common way.



Suppose it is a dry time, and the springs low, so that there is not water enough in the drain to cover the bottom, but yet so much as to continue running, it will form a zig zag line, something like that in the figure, on account of the inequality of the bottom. The bearded part of the line represents where the water deposits the sand or silt, so as in time to turn it into a fresh track and choke up the drain ; whereas in a drain, the bottom of which terminates in an angle, the sand by its own gravity sinking to the bottom, and the water, be the stream ever so small, being contracted at the bottom of the drain, the silt can find no place of rest, but must be driven by the force and weight of the water accumulating behind it, in proportion as it tends to deposit till it is driven out of the mouth of the drain.

In the year 1799, a great many thousand quarters of corn were lost to the country that might have been saved had the land been previously drained, which in a many situations might have been done at a trifling expence. It would be a desirable thing for this country, if the landlord would drain his own estate, and charge the tenant with the interest of the money expended for that purpose; for in fact the reclaiming of our peat and moory soils is almost like a new creation, and our sedgy bottoms, which from situation, would not pay the expence of draining, might be made more profitable by planting with aquatic woods, such as alder, willow, sallow, or ozier.

My lords and gentlemen, I must beg the favour to add a few more observations, which I hope will not be deemed foreign to the subject, that is, upon the cultivation of our waste lands, on the propriety of which I think at this moment we must be unanimous.

I myself have had betwixt four and five hundred sheep, and betwixt thirty and forty head of neat cattle, the chief but precarious subsistence of which was upon a common without stint: I solemnly declare, had I had the same proportionate number of acres in an inclosed and cultivated state, I could have kept the same number of animals in an improved state, with half the land under cattle crops and corn. I have for some time been in the habit of travelling about two thousand miles a year, through various parts of this country, and I never yet saw a piece of waste land, but what (if inclosed and properly cultivated) would breed and feed as many animals as it does in its present state, at the same time allowing a large portion of it to be under cattle crops and corn; besides, the improvement of the stock would nearly pay the expence of cultivation ; so that a large part of the corn produced would be clear to the public.

What idea would an ingenious foreigner form, who had a philanthropic feeling for his fellow man, in making the tour of Great Britain in this moment of scarcity, and viewing our thousands and millions of acres of land in a state of nature, occupied principally by the furze bush, the bramble, the heath, and the fern, interspersed with a number of half starved animals.

Might he not say, are these the lands of that industrious nation, the British people, whose fleets ride triumphant in every part of the globe, and whose manufactures are coveted by every civilized people upon the earth ? Had their agriculture had no restrictions, had the same exertion and attention been paid to their plough and their spade as has been to their trade and commerce, then their barren wastes had been fertile fields, their land had been a garden, their barns and granaries would have been filled with corn in the years of plenty to supply them with bread in the years of barrenness and scarcity, which a climate like theirs is more or less subject to.

They have still the means of future plenty within their hands, if their wise and vigilant legislature will join to their worthy examples of economy, wise and effective laws for the immediate cultivation of their wastes, beginning with those that lie the nearest to their cities and towns of greatest population, which always furnish the best means for luxuriant vegetation.

For surely rich, healthful, fertile fields, covered with fine waving crops of corn, and high fed animals, must be as pleasant for their citizens to see in their excursions in the country, as their barren heathy wastes, in part immerged in stagnant water.

Would they also encourage canal navigation, from their collieries to the interior parts of their country, that their peasants may be supplied with substantial fuel from the bowels of the earth, in lieu of the short-lived blaze which they in part procure from their wastes.

Likewise if they would loosen the bonds of prejudice, and do away the restrictions of the plough, to encourage the introduction and use of the best constructed implements for the abridgment of human and animal labour, by which means the bramble and the heath may be rooted out of their land, to make room for more useful vegetables. When these things are accomplished, then the valiant sons of Britain need not traverse foreign climes in search of food.

I have often, in travelling over wastes, where I have found their surface broken, stopped to examine the nature of their subsoil, and I never met with one but what was congenial either to improved grass or corn.

The subsoil, or soil immediately under the plough, should be the criterion to judge for what mode of culture land is best calculated. The surface may be manured and arranged in various ways, but little can be done to alter the soil below the plough. If more attention was paid to the nature of this, and not like the old adage, "Out of sight out of mind," many a thousand pounds might have been saved, that have been expended in fallacious schemes and wild experiments; for in this enlightened age, it would be deemed absurd for a farmer to expect upon the South Down hills of Sussex, the same luxuriant grass that is found in Romney Marsh; or that the blowing sands of Norfolk should feed an ox as large as the rich soils of the Vale of Aylesbury.

I shall conclude with observing, if a small portion of that money which we take to foreign lands to purchase corn, was expended in the proper cultivation of our fields and wastes, the balance would soon be turned in our favour, and we might still be a great and happy people.

For our country is large enough for our subsistence even with an increased population, if we did but cultivate it to the best advantage.

Recommendatory Letters to the Proprietor of the Patent Harrows.

SIR,

I RECEIVED a letter from you, dated the 2d April last, wherein you say, you have invented a hand thrashing machine, upon a most simple and easy construction; you further add, that you are called upon by a number of gentlemen for a description of it, and of your other improved implements of agriculture, with certificates of their utility from gentlemen who have used them. In answer to yours, as above, my opinion of your patent harrow, which I purchased of you in June, 1799, last, (when at Wooburn sheep-shearing,) is the best harrow that I have ever seen in all my life, for covering any sort of grain the best and most expeditious. I have used them every season since I had them, and have followed three ploughs all the wheat season, with two horses only in my clover lays, and have found that one single turn in a place is quite sufficient to cover the wheat, which is one turn less than I ever could cover it with my own harrow, therefore I must give you credit for them. In respect to your hand thrashing machine, I should like to see a description of it, but to tell you the truth, there was a person brought a hand thrashing machine into our island, (whose name I do not recollect), about three years ago, and it was tried before a number of our neighbouring farmers in a gentleman's barn, near the town of Newport, but it was not approved of; it required too much strength to be turned by hand, that nobody would purchase one of him; but whether your description is like his I cannot pretend to say; be that as it may, if a hand thrashing machine do not work easy, no person, I am persuaded, will ever use them long. I must now conclude in saying, you have my leave to print my opinion of your patent harrow, which I think deserves much credit.

I am, SIR,

Your most obedient, humble servant,

BARNABAS BULL.

Budbridge, Arreton, Isle of Wight,
May 1, 1803.

MR. LESTER.

SIR,

I HAVE two pair of your patent harrows, and find them to answer well, so much so, that I think no farmer ought to be without them ; they certainly cover the corn and seeds better in once going over the ground, than the common harrows do in twice. You are perfectly at liberty to make what use you please of the above statement.

I am,
Your humble servant,
B. LEVI.

Northampton, April 10, 1803

SIR,

IN answer to your letter, requesting my opinion of the patent harrows and cultivator, which I purchased from you, I have no hesitation in saying, they appear to me to do their work most effectually ; and I shall continue to make use of them as the best implements of the kind I have hitherto seen.

I am, SIR,
Your humble servant,
RICHARD COOPER.

Stretton,
April 30, 1803.

SIR,

My opinion of your chaff-cutter is, that it does its work perfectly. Of your cultivator, that it is a well contrived and very useful instrument; and of your harrows that they are the best I ever saw in use. If you consider the publishing this statement likely to be of any use to you, you are welcome to do it.

I am,
Your well wisher, &c.
G. TALBOT.

Guiting, near Morton in the Marsh,
April 13, 1803.

C. WHITTINGHAM, *Printer*, Dean Street.

OBSERVATIONS

ON THE UTILITY OF

CUTTING HAY AND STRAW, AND BRUISING CORN,

FOR

FEEDING OF ANIMALS,

WITH A FULL AND PARTICULAR

DESCRIPTION OF THE BEST MACHINES FOR THAT PURPOSE;

WITH

APPROBATIONARY CERTIFICATES.

ALSO,

A NEW AND VALUABLE DISCOVERY,

BY WHICH MEANS EVERY

FARMER MAY SEPARATE THE MORE NUTRITIOUS PARTS OF HIS STRAW,

FOR FEEDING ANIMALS,

FROM THE REFUSE, WHICH MAY BE USED FOR LITTER.

OBSERVATIONS,

&c. &c.

THE practice of Cutting Hay and Straw for Feeding of Animals has increased in proportion as its good effects have become known. The original mode of foddering cattle was by laying the hay or straw in small heaps in the field; in particular cold weather, under the hedges, or in the most sheltered parts, by which means, the master cattle driving the underlings from heap to heap, either through caprice, or to obtain the most delicate morsel, a considerable quantity is either trampled in the ground, or rendered useless by the soil from their feet. Several hundred tons of fodder are thus destroyed every winter in this country, which might, by a different practice, be converted to the best of purposes, for which it was at first intended. Practical observations and rational economy have not only shewn us the impropriety of giving cattle their food in winter spread abroad in the field, but it condemns the practice of letting them range at large in the summer season, particularly on the more succulent plants, such as clover, saintfoin, tares, &c. As the earth in our climate does not spontaneously produce those vegetables on which our cattle delight so much to feed, but are cultured for their use by the industrious care of man, he, therefore, who by his toil and perseverance has procured a large crop of these plants, must be blind to his own interest to suffer his cattle to destroy as much by their feet as they consume with their mouths, when by extending to them a small portion of his former care, he might accomplish the object he first had in view, that is, to produce the most animal food from a given quantity of land. The practice of soiling, or feeding of cattle with green food in the stall, is rapidly gaining ground, which is one of the most useful of the late improvements in agriculture. By common observation on animal economy, it is found that they prefer as food one species of vegetable to another, either in a green or dry state, and very often one particular part of the same vegetable, from its being the most agreeable to their particular tastes. It is from this motive alone that they make the selection when they roam at large among the endless variety on the verdant lawn ; not from the quantity of nutriment they contain, but from their being more agreeable to their palate ; for it is probable that the plants they refuse are not less pregnant with nutritious particles, but may be more acrid or pungent to the taste, which may be corrected by being mixed with the milder ones in a way that will prevent selection. This I presume cannot be done so effectually by any other means as by cutting them into small particles. This so completely mixes them together as to prevent selection by the most sagacious animal. Before the practice of cutting was introduced, it was customary with the most economical farmers, to mix hay and straw together at the time of making the hay-rick ; that is, by laying a course of straw and a course of hay stratum super-stratum, and to mix them more effectually at the time of consuming by shaking them well together with the fork ; but this did not effectually answer the desired purpose, for the animals would very often select the hay and leave the straw. This is totally obviated by cutting. There are some farmers who object to cutting, by reason of its adding nothing to the substance. By this futile way of reasoning, they presume there is no advantage gained by assisting mastication, or by inducing animals to eat that by art which they would have refused by nature. The advocates of this principle are but few, and their numbers are daily diminishing. The late scarcity of vegetation has made more converts to this system than perhaps any other cause. So strong and powerful is necessity to destroy prejudice, that it very often impels man to think and act in a way he would not in the midst of plenty, which causes future good to arise out of present evil. The profit to be derived from inducing animals to eat that food by the process of cutting, which they would not, or with very little advantage, in its natural state, became so obvious, that it induced man to construct an engine for that purpose, by which the labour was facilitated, and the practice became more universal; so that at the present moment a good chaff engine has become the most useful and necessary implement upon a farm; but the construction of the first engine, though remarkably simple, required time and practice to learn the art of working it, and could not be worked by any indifferent person; so that it became a particular profession among the labourers. A man purchased an engine, or more vulgarly a chaff-box, learned the art of working it, and went from house to house with his box upon his back, cutting the chaff at a certain sum per bushel or quarter, by which means the farmer was supplied with chaff to mix up with his corn for his working horses, the economy and profit of which in time became so obvious that he wanted more chaff than the travelling chaff-cutter was able to supply; he therefore found it to his interest to purchase an engine himself, and his horse-keeper, or other servant, was taught the art, by which means he supplied himself with a sufficient quantity for his then demand, after which it became his particular enquiry at the statutes, when hiring his servant, to know whether the person that offered himself could cut chaff, this being strictly observed in the agreement, which qualification was no small consideration for the servant to obtain better wages. This is and has been the practice in several of the arable counties for some years, by which means the farmer is enabled to keep his working cattle in better condition and at less expence than when their racks were filled with hay, which is now totally discontinued by the economist, and used in no other form but mixed with straw for chaff.

The most apparent advantages of cutting, which have been deduced from practice, are, first, to facilitate the mixture of different substances, and by that means to induce the animal to eat those plants or parts of plants which he would have refused alone in their natural state, even till he was reduced thereto by extreme hunger; second, to assist mastication, by which means the most urgent calls of nature are more immediately supplied; for it is well known that a horse will eat a sufficient portion of food when it is cut in half the time he would in its natural state; and thirdly, he will break his corn more effectually when mixed with this chaff in small portions, which is an object of great importance in animal economy.

These are the principal advantages observed in practice, of which I think the first was the original cause.

The advance in the price of labour, and the importance of cutting food, not only for the working animals, but for the feeding ones, has become so obvious as to cause a demand for a greater quantity than could be conveniently procured by the known methods of cutting. This induced the public to wish for some more improved machinery, by which the labour might be abridged, and a greater quantity cut in a given time. This set the mechanics to work to endeavour to produce an engine that would answer the desired purpose, and numbers of plans were introduced, each professing superiority in progression as they were brought out. These severally were bought up by the gentlemen and farmers with avidity; but, unfortunately, when they were brought into practice, they were found not to answer the purpose that was expected. Either from the complication of their machinery, or from the great labour required to work them, they became useless, and the purchasers found themselves completely duped, at the no small exultation of their labourers and servants, whose privileges they thought would be infringed by their success.

These engines, after some anxiety, were consigned to the lumber room, and the common box again resorted to. This considerably damped the ardour of the farmer in trying new schemes, as they are called; but it stimulated the mechanic to attempt to remove the difficulties and objections complained of. These attempts were in a great measure frustrated, by their adhering to a mistaken idea they had formed in mechanics; viz. that two or three knives working on the same machine would cut more than one, without considering the complication and extra power required to work them. On this rock they have generally split. The other great difficulty was to bring the substance forward accurately to be cut. Their general resort for this purpose was by two rollers or cylinders, of different forms, working reverse ways. The general objection to this mode of feeding is, that they are always liable to choke, and do not feed regular. These difficulties united rendered the manufacture very precarious, and caused many of the makers to give up totally the idea of further attempts to improve on a bad principle; in consequence of which they turned their hands to more certain employment.

Having made the implements and machines in agriculture my study through life, by which means I have been enabled to bring that common, though useful implement, the harrow, to a state of perfection never before known in this or any other country; the general approbation this improvement received, stimulated me to turn my attention to the improvement of the straw-cutting machine, on which I expended nearly one thousand pounds before I obtained the desired object; how far I have succeeded the following description and certificates will shew.

Plate II. shews the feeding part of my improved straw-cutter.

A is a brass rachet wheel fixed upon the axis of a cylinder, whose surface is rough over, which works a piece of sacking at the bottom of the box, which brings forward the straw in proportion as the wheel is moved by the lever D at every revolution of the fly wheel. B dotted lines represent the sacking passing over a cylinder at the hinder part of the box, which is drawn back occasionally by a screw to tighten the sacking. C the long lever that is raised at the end, by the index E, to different heights, to vary the length. D a catch fixed by a moveable joint to the short lever, by which the rachet wheel is moved. This catch, when thrown back by the finger, stops the feeding motion; it will fall back out of the tooth of the wheel by the fore part of the machine being lifted the highest, as is very often done by loading it on a waggon. It is necessary here to observe, that I sent one into the country, that had the catch turned back by either putting on or taking off the waggon, which when attempted to be set to work, there was no feeding motion ; in consequence of which I received several letters from the gentleman, saying the engine would not work at all, and was of no use to him. After his having kept it three months, I informed him he might return it, and I would remit him the money by post; just as he was going to send it off, it was discovered that the catch was off the wheel, which was put on and set to work, and has given great satisfaction ever since.

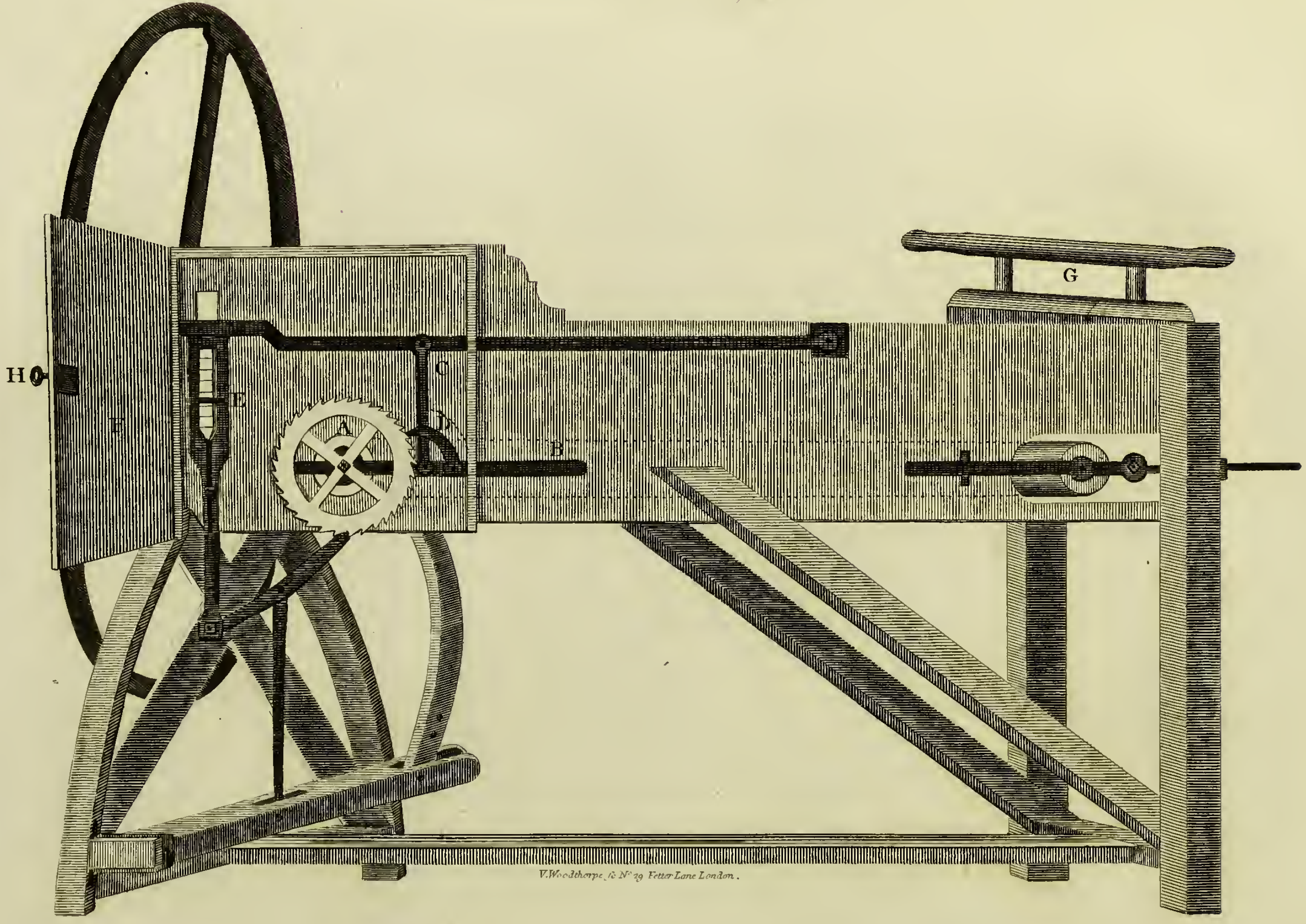
It is necessary this catch should be at liberty, not only for the facility of working, but that it may be thrown off to prevent the machine being worked at an improper time. E the index, by the raising or falling of which the length to be cut is regulated. F the door of the regulating box, with H the lock, by which the regulation index is secured, so as always to give the proprietor of the engine the command of the length he wishes to have cut, which prevents the liability of imposition on the part of the worker, whether he works by the great or the day. G the moveable block that presses the straw down to the sacking, and rides upon it forward till it comes to a guard rail in the front; it must then be moved back upon a fresh yelm. This motion, though the most simple that can be conceived, (and the most useful for this purpose), caused me more trouble and expence than all the other machinery. I discovered it by accidentally laying a hammer out of my hand upon some straw in the box, at a time when I was trying another motion for that purpose. After I had spent many months in trying various motions to set aside the rollers, this discovery was a very welcome article, by which it forms an engine that answers every purpose that was desired.

The propriety of fixing only one knife upon a fly wheel will be fully explained by plate I. and the following description.

The fly may be applied to several sorts of engines, whether moved by men, horses, wind, or water, or any animate or inanimate power, and is of great use in those parts of an engine which have a quick circular

Plate 3.

Lester's Patent Straw Cutter



V. Woodthorpe, sc. No. 29 Fetter Lane London.

Pub. by Wm. Lester Octr. 1803

motion, and where the power or the resistance act unequally in the different parts of a revolution. This made some people fancy that the fly added a new power, supposing that a fly joined to an engine that is to move round helps to carry it about. But though it may be said in some way to facilitate the motion, by reason that it makes it more uniform and equal, yet upon the whole it causes a loss of power and not increase; for first, it requires a continual supply of power to put the fly in motion to a certain degree of velocity, and to keep and maintain it in that velocity, for the fly has no motion of its own but what it receives from the impressed force; secondly, the rubbing and wearing of the pivots or gudgeons of the axis still hinder and lose the impressed motion; and thirdly, the air through which the fly moves, will in some measure impede its motion, and with all these impediments together, if the fly be not still supplied with new power, will make it stand still and be at rest.

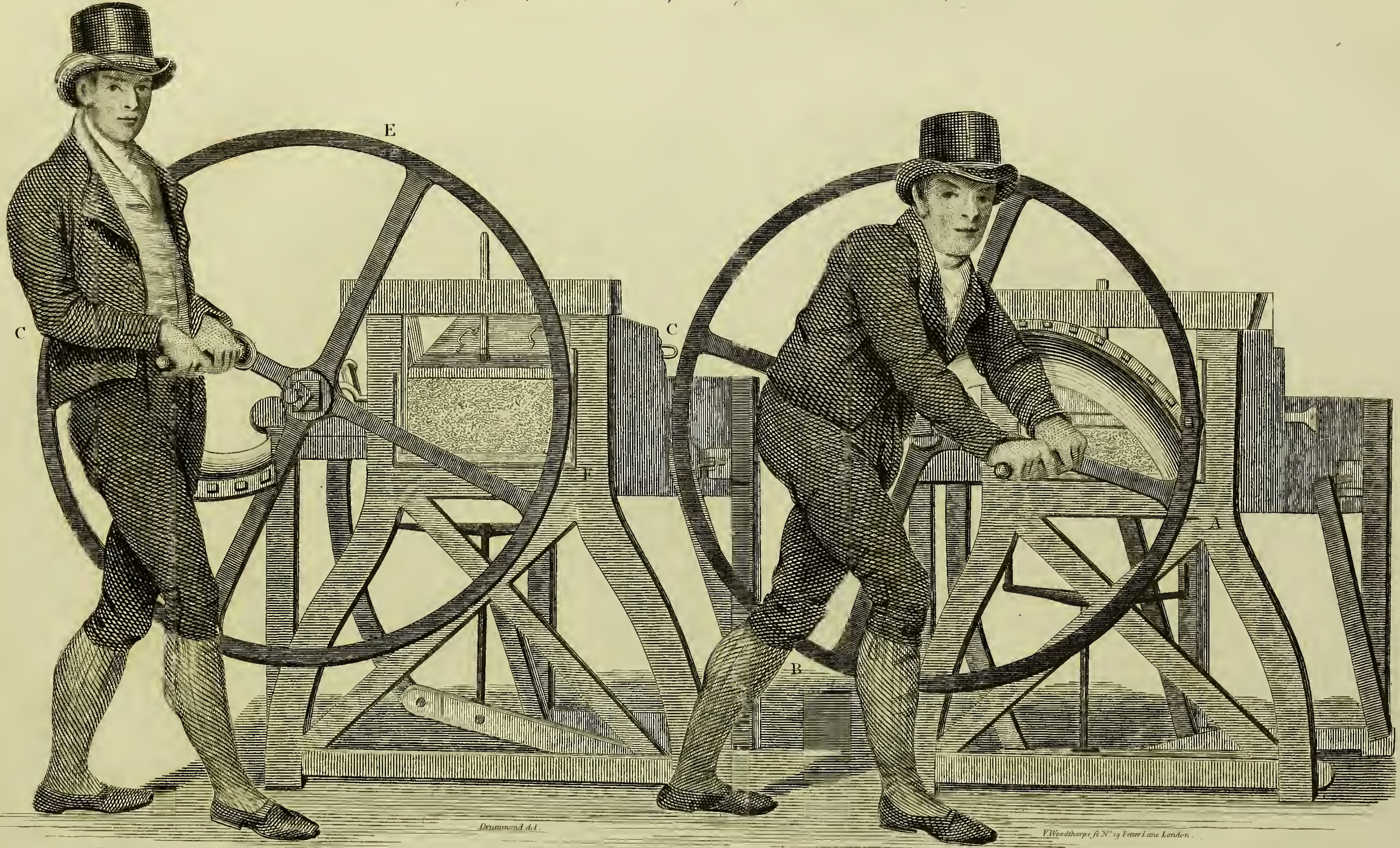
As the fly is not a gainer of power, but a regulator of it, the more equal the power and the resistance are at all points of the revolution, the less use is the fly; if they were quite equal it would be of no use, and it is of the greatest use where the resistance is at that point of the revolution where the greatest power can be applied, so that placing the resistance at two or more points of the revolution, is doing away in a great measure the advantage that is intended to be derived from the fly, whence the absurdity of applying more than one knife on the fly-wheel for the purposes of cutting straw. I do positively assert, that I can cut more straw in a given time with one knife on a fly, than any number that can be applied by the same power.

To elucidate this important subject more fully, observe the right hand figure of plate I. From A to B the point of the greatest resistance corresponding with that point of the revolution where the man can apply the greatest power; from A to B a man of moderate strength can apply 160 pounds power, from B to C 130 pounds, from C to E in the left-hand figure only 27 pounds, and from E to F 30 pounds. After the knife has passed the centre of the yelm, the compressed straw re-acts and impels the knife forward, by the rising of the crank, after having traversed the lower centre line, by which means there is only required in one revolution of the wheel one instantaneous exertion, and that at the very point where the man can apply the greatest power with the most ease to himself, so that the straw is violently compressed, which assists the knife to make a clean cut. Even with a thick edge, I have cut with this machine some of the softest barley straw I could procure, finer than the finest bran a baker could produce, for a wager.

The knife should be ground and whet on that side only towards the man, the steel keeping the other side sharp.

To cut straw with this engine to the greatest advantage, two people should be employed, one to turn the fly-wheel, the other to yelm and feed ; the box should be kept easy full, and in cutting clover, vetch, or saintfoin hay, the moveable block will require some additional weight. With regard to its superiority over every other machine, the following certificates will say more than volumes wrote by myself.

Shewing the different Powers of the Fly Wheel of the Straw Cutter.



Drummond del.

V. Woodthorpe, sc. No. 29 Fetter Lane London.

Pub. by Wm. Lester Jany. 3. 1804.

CERTIFICATES

FROM

GENTLEMEN WHO HAVE USED THE PATENT CHAFF ENGINE.

Welton Farm, April 15, 1803.

SIR,

YOURS, dated the 12th instant, came duly to hand, and as I think too much praise or *reward* cannot be bestowed on any person who invents *(and makes known)* any engine so useful, easy to work, as well as expeditious, as your *Patent Chaff Engine,* I have done all in my power to recommend it, and can with truth say, that it is the most complete engine of the kind I ever saw; by far surpassing those that have been invented with three knives, which I have seen and had. I had it publicly examined and approved of in this county, and my friends will immediately order a great many. I am convinced that at least twenty can now be sold at Hereford, which, if conveyed by the canal to Gloucester, would make the carriage come much easier than by the waggon, and can be forwarded from Gloucester by the Hereford waggon. I wish you every success in the Thrashing Machine.

And remain, SIR,
Your humble servant,
WILLIAM ARMITON.

P. S. I am convinced I have saved double the price of the Chaff Engine, in *this year alone*, in cutting hay and straw for fourteen horses and twenty oxen, and this all done by my yard man, exclusive of his attending the stock.

Nozeing, April 27, 1803.

SIR,

YOU requested a certificate in favour of a Patent Hand Chaff Engine, (No. 101) purchased of you in February, 1802. The fairest testimony I can give, is to state the quantum of work your machine has actually performed in a certain time, and to notice its merits and defects as far as I am capable of judging.

The machine, for the last twenty weeks, has been constantly worked by one man only, without any assistance whatever, and has supplied with food thirty dry cattle, which ate nothing else but chaff, and twelve others, (cows and horses,) whose food was half chaff, i. e. equal to 36 cattle fed wholly on chaff.

The average of each day's work was between five and six quarters per day, 16 strikes to the quarter. The same man has with an assistant cut nine quarters in one day of ten hours work.

The merits of the machine are,

1. The much greater quantity of chaff one man, without even a boy to assist, can cut with your engine in a day, than he can with a common chaff-box.

2. Any labourer who has not the skill to cut in a common box, can use the Chaff Engine. A blind man even may work it; but then he must have a boy to yelm and assist in filling the box, the reason of which is obvious.

3. The work may be done by the great for exactly half the price the chaff-cutter must charge, independent of the difficulty of obtaining such a man when wanted.

In a word, your Chaff Engine is very far superior to any other I have ever yet seen, and indeed I must say it deserves the greatest encouragement.

I remain, SIR,
Your humble servant,
ROBERT H. AUBER.

Mr. Lester,
No. 251, High Holborn.

Weeley Hall, near Thorp, Essex, 15th April.

SIR,

IN compliance to your request, I feel a duty in giving encouragement to a man who appears to study hard in endeavouring to please and satisfy the public with his various ingenious and useful implements in husbandry, particularly the Chaff Engine, which I approve of much, and find it answers my expectations most fully, it being much superior to any I have seen. If this assertion of mine will be of any service to you, you are extremely welcome to use my name.

I am, SIR,
Your most obedient,
JAMES J. RICHARDSON.

Filgrove, May 23, 1803.

SIR,

IN answer to your request I have no hesitation in declaring my opinion on your Chaff Engine. It exceeds every thing of the kind I ever saw; it exceeds even what I expected. I believe it will do double the work in the same time as the common chaff-cutter. I see no judgment wanted to work it, if you keep it properly feeding.

SIR, I am your most obedient,
WILLIAM SWANNELL.

Whitchurch, Oxon, 18*th April,* 1803.

SIR,

THE Chaff Engine I had of you is a very useful machine, and one I would by no means be without. I am constantly using it for cutting hay for my sheep, and chaff for my horses, which is generally done by lads or men, whose time I want to make out. A man has just undertaken it to cut by the basket, at half the customary price of the country, and have no doubt but he will make good work at it.

I am, SIR,
Your very humble servant,
A. H. KELSEY.

To Mr. William Lester.

Englefield, April 14, 1803.

SIR,

AT your request I send you my opinion of your Chaff Engine, which I highly approve of, as being superior to any I have seen for cutting chaff for cows, sheep, &c. You have my permission to publish the same, being convinced of its utility.

I am, &c. yours,
WILLIAM STONE.

N. B. I should much like your pamphlet when it comes out.

Burnham Thorp, April 18, 1803.

SIR,

YOU wish to have my opinion of the utility of your Patent Chaff Engine; my opinion is, it performs its work better than any thing I have yet seen of the kind.

I remain your humble servant,
THOMAS IVES.

Cheriton, Kent, May 19, 1803.

SIR,

I HAVE taken the liberty of writing to inform you, that your Chaff Engine met my expectation. I am very much pleased with that useful engine, as I am able to cut, with one man, enough to supply 300 sheep and some bullocks; and I am able to make two loads of straw go as far as three loads without cutting. Sir, you will excuse my not writing more of the particulars, as time is short.

I am your humble servant,
THOMAS SQUIRE.

Haven House, 6*th May*, 1803.

SIR,

YOUR letter I received, requesting my opinion of your Patent Chaff Engine, which is far superior to any thing of the kind I ever met with before, and is what I recommend to all my friends——Will thank you to make one as soon as you conveniently can for John Hardham, Esq. Grandby-row, Manchester. Please to drop me a line when you send it off, and I will remit you the money for it. Should be glad to see the model of your Thrashing Machine, and likewise the expence of it.

I am, SIR,
Your humble servant,
T. GREENWOOD.

Russ Hill, May 10*th*, 1803.

SIR,

I HAVE used your Chaff-cutter a good deal, and find it answer extremely well, and so do my people, who speak of it as one of the best they have seen used.

I am your humble servant,
JOSEPH VENOUR.

Stoke Plain, August 8th, 1803.

SIR,

UPON adjusting my papers, was very sorry to find yours, dated June 9th, not answered; in respect to the Chaff Engine, my opinion is that it is superior to any that I have ever seen.

I am, SIR,
Your well-wisher,
JOHN WOODHOUSE.

Brotherton, near Ferrybridge, Yorkshire, October 7th, 1803.

MR. WILLIAM LESTER,

SIR,

I DO with every satisfaction inform you, that the Patent Chaff Engine you sent me some time ago, upon my own conditional terms, which were, that, if agreeable to you, I would take one upon trial a few weeks, and if not approved, would return it free from damage, allowing a couple of guineas and paying the carriage both ways; on the contrary, if found to answer my intention, would keep it upon the terms of your advertisement. Having had it in almost constant use for several months, I do not hesitate to declare that it fully answers every expectation I had of it, and surpasses four or five I have seen in my neighbourhood, upon as many different constructions; I shall with confidence recommend the use of them to my friends. You are at liberty to publish this declaration, willing and desirous to contribute as much as I can to improvements, particularly those of agricultural kinds.

I am, SIR,
Your sincere friend,
GEORGE ALTHASS.

I HOPE these certificates will sufficiently satisfy the mind of every inquiring gentleman, of the utility of my improvements on the Straw-cutter, as I should deem myself highly culpable in taking money for an article that did not answer the intended purpose. But so much was the ardour cooled in search of an article of this kind, by the recent unsuccessful attempts at improvement, that I found it necessary, on the first introduction, to pledge myself responsible for its being a real improvement, or that I would take nothing for it. This mode of proceeding has so fully established its fame, as to render those conditions totally unnecessary.

The success of this Engine has led, perhaps, to one of the most valuable discoveries in agricultural science; by enabling the farmer to extract the sweets from the refuse of his farm for the most valuable of purposes, that of feeding animals, the theoretical part of which will be found in the following observations.

ON SEPARATING THE
NUTRITIOUS PART OF STRAW
FROM THE
PARTS OF LESS VALUE, AS FOOD FOR ANIMALS,
BY MEANS OF THE FOLLOWING VERY SIMPLE PROCESS.

THAT there is a certain portion of the straw of corn, containing a far larger quantity of nutritive substance than other parts, will be admitted by every observer conversant in vegetable economy. This being granted, the observation pursued will probably point out what part of the straw contains these super-abundant riches from that which is deprived of them.

It is well known that the saccharine substance is, of all others, the most nutritive in animal food. And in proportion as this exists, so is the food rich or poor.

It will be found by examining the straw of corn, that the greater part of this substance is contained in the cavity of the straw immediately above the knots, in the form of pith, which being scraped out with a penknife, when the knots are cut longitudinally, and put upon the tongue, the sweets are immediately perceptible. This may be found in all straw in a dry state, but much more when it is green. The under part of the knot does not contain any of this sweet pithy substance visible to the naked eye, but appears an empty space, void of any substance; so that it seems as if the valves contained in the knot had closed, and prevented the superabundant support of the seed from subsiding to its parent earth. This pithy saccharine substance, I presume, was in a liquid state at the time the seed was perfecting, which, when completed, the efforts of nature probably stop, and congelation takes place; by which means these reservoirs become charged with the above sweet nutritive substance. May this not be the case with all our grasses that stand to perfect their seed, or that are cut before their seed is ripe? If so, the same means I propose to separate the more nutritious parts of straw, will hold good with regard to hay, by which means a richer food may be obtained, next unto corn, for animals, than has yet been discovered in the annals of agriculture. Be this as it may, I must leave it for practice to demonstrate, and content myself with giving the hint.

I shall now briefly state how this idea of separation originated. About eighteen months ago, I was applied to by one of the managers of a very large intended manufacturing concern, for the purpose of making paper from straw, and offered a large sum of money if I could produce an engine that would separate the knots from straw, as they then employed a considerable number of hands to cut them out with shears. This I at that moment conceived next to impossible, but from an accidental observation some months after, in cutting some strong wheat straw, I found the knots to fly, by the concussion of the knife, to a considerable distance from the machine, beyond the parts that contained no knots. From this observation I concluded, that the object was discovered that was so interesting to the paper-maker. Having a winnowing machine standing by the straw engine, I put the cut straw into it, and passed it through, when I found the knots, from their gravity, come through the sieves like corn, and the other blowing away as chaff. I now found the possibility of constructing an engine for the complete separation of the knots from cut straw, and immediately went to the paper manufactory, intending to make a contract for the engine they so much desired ; but, to my utter disappointment, the works were stopped ; for what reason I know not. Had it been for the want of an engine to take away the knots, I am confident I could have set them to work again ; but I candidly confess it was this application, and this disappointment, that drew my attention to the process for agricultural purposes, the importance and propriety of which practice alone will demonstrate. The mode is simple, and the expence trifling, within the reach of every farmer ; it is only to cut his straw, and either heave it down before a wind, or throw it with a shovel, which will always separate the heavy substance from the light, in exactly the same way as dressing of corn. The separation will be complete if the straw is cut an inch long.

As the process of cutting facilitates the mixture of plants of different tastes and qualities, so will it also, with the assistance of wind, facilitate the separation of the more nutritious parts of different vegetables, used as dry food for animals for the more immediate application to feeding or store stock, the propriety of which, I presume, will be obvious to every gentleman who has turned his attention to this interesting subject.

This, perhaps, may be objected to in some situations on the account of the refuse being cut too short for litter ; but I do not believe this will be by any means a general objection, for there are advocates on both sides the question. Some maintain that it is best to consume as fodder the whole of the straw produced upon a farm ; while others contend the reverse, that it is best to consume the straw as litter. Perhaps the middle way is preferable ; but the public must admit that that is the best method which produces the most animal food, particularly at this time, when there is such a disproportion betwixt the price of bread and meat. In that case, the rules of economy will reasonably lead us to prefer the use of the most nutritious part by all the best known methods of obtaining it; therefore I conclude, it will make no difference to the beast whether his bed be long or short, so that he can obtain the greatest quantity of nutriment from the smallest quantity of food; and I presume the dung will lose nothing in its time to be returned to the land from this disunion of its parts.

ON THE

ADVANTAGE AND UTILITY

OF

BRUISING CORN FOR HORSES,

WITH THE BEST MACHINES FOR THAT PURPOSE.

BRUISING of Corn for Horses is nothing more than assisting mastication by art. It may be observed that many horses void their corn whole, and even in a state that it will vegetate after having passed through the body of the animal. In this case the propriety of bruising must be obvious; for when there is no dissolution of the farinaceous and animalized matter, the combination of which forms the saccharine substance, the most nutritive and desirable food to all animals, the body cannot have derived much nutrition from food voided in such state. This, I presume, gave the idea for bruising by art; a very rational one, and would, I am fully persuaded, become universal, could some simple and effectual machine be invented for this purpose. There have been several attempts, but most of them are too laborious to work by hand, and others mealing the corn too much; whereas, for obvious reasons, it should not be mealed at all. The greatest difficulty is found in bruising oats, from the glutinous substance discharged from them by the pressure, which adheres to the rollers, and in a short time chokes up the mill. Could this effect be got rid of, I am confident the desired object would be accomplished.

The best machine I have yet seen for this purpose is one for which a Mr. Passmore has lately obtained a patent. A portable horse-power, of a simple and cheap construction, would be the best mode for all these purposes; not that I suppose it requires so much power to bruise oats as to meal them; for there appears to be a greater probability of the success of a hand-bruising machine, than there does of every man being his own miller. By the means of a hand flour mill "the ephemera of the day," the bruising of corn may be done by an instantaneous pressure; but grinding of it into meal effectually requires friction, and to produce that necessary friction requires surface. That surface, kept in a proper motion, requires power more than man will be able or willing to apply, if he can obtain his bread in any other way. Whatever machine abridges the labour of the hand will always find a market in every country, and a welcome reception by men that work there; but whatever machine renders the process more laborious, is sure to get into its proper place, that is, in the dark corner of the lumber room.

This should be the criterion by which all schemers or contrivers of machines for hand-labour should be guided, or otherwise they will only spend their time and money in vain. They perhaps may impose upon that part of mankind who have but little knowledge in mechanical powers; but, in time, the novelty that caused them to purchase will cease, when the machine will be condemned, and the contriver brought into disgrace. The public approbation can only be retained by an article that is substantial and really useful. If these observations should be found any way serviceable to check the impositions that daily occur in this way, the intended purpose will be answered. People should be careful how they purchase articles they do not understand, and should always take this for their guide, to see that the utility of them is fully testified by credible certificates; for it is giving credit to these dabblers in mechanics, that checks improvement more than any other cause, and prevents the introduction of that which is really useful; for a burnt child dreads the fire.

ON

THRASHING

AND

THRASHING MACHINES,

FROM

VARIOUS AUTHORS, WITH OBSERVATIONS.

THE operation of thrashing is performed in a variety of ways, sometimes by the feet of animals, sometimes by flail, and sometimes by a machine.

"The most ancient method of separating the corn from the straw was by the hoofs of cattle or horses. This was practised by the Israelites, as we find from the books of Moses; it was also common among the Greeks and Romans*. Flails and thrashing machines were also not uncommon among these nations†. The flail which was used by the Romans, called baculus, fustis, or pertica, was probably nothing more than a cudgel or pole. The thrashing machine, which was called tribula or tribulum, and sometimes traha, was a kind of sledge made of boards joined together, and loaded with stone or iron; horses were yoked to this machine, and a man was seated upon it to drive them over the sheaves of corn (1)."

"Different methods are employed in different countries for separating the corn from the stalk. In the greatest part of France the flail is used; but in the southern districts it is generally performed by the feet of animals: animals are also used for the same purpose in Spain, in Italy, in the Morea, in the Canaries, in China, and in the vicinity of Canton, where the flail is also sometimes used. It appears that in hot climates the grains do not adhere so firmly to the stalk as in cold countries, and therefore may be more easily separated. This will explain the reason why animals are so frequently employed in hot countries for treading out the corn; whereas in cold climates we know they are seldom tried, and have no reason to suppose that they would answer the purpose. In the Isle of France, in Africa, rice and wheat are thrashed with poles, and maize with sticks; for it has not been possible to teach the negroes the use of the flail.

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* Pliny, xviii. 30. Virgil, Georg. iii. 132. Col. ii. 21. Tibull. i. 5, 21.

† Isaiah xxviii. 27. Homer, ii. xx. 495.

"The animals used for treading out corn are, oxen, cows, horses, mules, and even asses, when the quantity is not great. The operation is performed in this manner; the sheaves, after being opened, are spread in such a manner that the ears of the corn are laid as much uppermost as possible, and a man, standing in the centre, holds the halters of the cattle, which are made to trot round as in a manege; whilst other men with forks shake the straw up from time to time, and the cattle are trotted over it again and again till they have beaten out all the grain. This method is expeditious enough; but besides bruising a considerable quantity of corn, it requires a great many cattle, and injures the legs of the horses and mules, which are preferred before cows and oxen for this work.

"The flail is undoubtedly a much better instrument for thrashing corn than the feet of animals, for it separates the grain from the straw and husks, both more effectually and more expeditiously; yet it is liable to many objections. It is a very laborious employment, too severe indeed even for a strong man; and as it is usually the interest of the thrasher rather to thrash much than to thrash clean, a good deal of corn will generally be left upon the straw. It is therefore an object of great importance in husbandry to procure a proper machine for separating the corn from the straw (2).

"The first thrashing machine attempted in modern times, of which we have received any account, was invented in Edinburgh, by Mr. Michael Menzies, about the year 1732. It consisted of a number of instruments like flails, fixed in a moveable beam, and inclined to it at an angle of ten degrees. On each side of the beam in which the flails were fixed, floors or benches were placed for spreading the sheaves on. The flails were moved backwards and forwards upon benches by means of a crank fixed on the end of an axle, which made about 30 revolutions in a minute.

" The second thrashing machine was invented by Mr. Michael Sterling, a farmer in the parish of Dunblane, Perthshire. Of this discovery we have received a very accurate and authentic account from his son, the Reverend Mr. Robert Stirling, minister of Crieff.

" It is an old proverb, that necessity is the mother of invention. This was verified on the present occasion. Besides his ordinary domestic servant, Mr. M. Stirling had occasion sometimes to hire an additional number to thrash out his grain, and frequently found it difficult to procure so many as he needed. This naturally led him to reflect, whether the operation of thrashing could not easily be performed by machinery. Accordingly, so early as the year 1753, under the pretence of joining in the amusement of his children, he formed in miniature a water mill, in which two iron springs, made to rise and fall alternately, represented the motion of two flails, by which a few stalks of corn put under them might be speedily thrashed. This plan he executed on a scale sufficiently large within two years after, making the spring about ten feet long, each of which had one end firmly screwed into a solid plank, and the other terminated in a round batoon of solid iron, two feet long and above an inch in diameter; under these the sheaves were conveyed gradually forward in a narrow channel or trough, by passing between two indented horizontal cylinders, similar to those now used in most of the thrashing mills in that part of the country, and called feeders. In this manner the thrashing was executed completely, and with considerable rapidity; but as the operation was performed on a low floor, and no method contrived for carrying off the straw, the accumulation of it produced such confusion, and the removal of it was attended with such danger, that this scheme was very soon entirely abandoned. The mortification arising from disappointment, and especially the scoffs of his neighbours, for what was universally accounted an absurd and ridiculous attempt, served only to stimulate the exertions of the inventor to accomplish his designs on other plans.

" Laying aside therefore the iron springs with the feeders, and all the apparatus adapted to them, he retained only an outer or water wheel, with an inner or cog-wheel moving on the same axle; to this inner wheel, which had 48 teeth or cogs, he applied a vertical trundle or pinion, with seven notches, the axle of which passed through a floor above the wheel, and having its upper pivot secured in a beam six feet above that floor. At the distance of three feet three inches above the floor, two straight pieces of squared wood, each four feet long, passed through the axle of the trundle at right angles, forming four arms, to be moved round horizontally. To the extremities of these arms were fixed four iron plates, each 20 inches long, and eight broad at the end next the arms, but tapering towards a point at the other end. This large horizontal fly, constituting four thrashers, was inclosed within a wooden cylindrical box three and an half feet high and eight in diameter; on the top of the box was an opening or port (two or three ports were made at first, but one was found sufficient,) eight inches wide, and extending from the circumference a foot and an half towards its centre, through which the corn sheaves descended, being first opened and laid one by one on a board with two ledges gently declining towards the port; on which board they were moderately pressed down with a boy's hand, to prevent them from being too hastily drawn in by the repeated strokes of the thrashers. Within the box was an inclined plane, along which the straw and grain fell down into a wide wire riddle two feet square, placed immediately under a hole of nearly the same size. The riddle received a jerk at every revolution of the spindle from a knob placed on the side of it, and was instantly thrust backward by a small spring pressing it in the opposite direction. The short straw, with the grain and chaff which passed through the wide riddle, fell immediately into an oblong strait riddle, which hung with one end raised and the other depressed, and

and was moved by a contrivance, equally simple as the other; and having no ledge at the lower end, the long chaff, which could not pass through the riddle, dropped from thence to the ground; while the grain and most of the chaff, falling through the riddle into a pair of common barn fanners, that stood under it on the ground floor, the strong grain, the weak, and the chaff, were all separated with great exactness. The fanners were moved by a rope or band, running circuitously in a shallow niche cut on the circumference of the cog-wheel. The straw, collected gradually in the bottom of the box over the wide riddle, and through an opening two and an half feet wide, and as much in height, left in that side of the box nearest the brink of the upper floor, was drawn down to the ground with a rake by the person or persons employed to form it into sheaves or rolls.

"Such was the thrashing mill invented by Mr. Michael Stirling, which, after various alterations and improvements, he completed in the form now described, A. D. 1758. By experiment it was found that four bolls of oats, Linlithgow measure, could be thrashed by it in twenty-five minutes. From that period he never used the common flail in thrashing, except for humbling or bearding barley. In every other kind of grain he performed the whole operation of thrashing with the mill; and continued always to use it till 1772, when he retired from business, and his thrashing mill became the property of his second son, who continues to use it with equal advantage and satisfaction. Several machines were constructed on the same plan, particularly one near Stirling, under Mr. Stirling's directions, for Mr. Moir, of Leekie, in 1765; which, we understand, has been used ever since, and gives complete satisfaction to the proprietor. There was another erected in 1778, by Mr. Thomas Keir (in the parish of Muthil, and county of Perth), who has contrived a method of bearding barley with it; and by the addition of a small spindle with short arms contiguous to the front of the box, and moved by a band common to it and the great spindle, to which it is parallel, the straw is shaken and whirled out of the box to the ground. That this machine did not come immediately into general use, was owing partly to the smallness of the farms in that part of the country, whose crops could easily be thrashed by the few hands necessarily retained on them for other purposes; and chiefly to an apprehension that the machine could only be moved by water; an apprehension which experience proves to be entirely groundless. The machine, however, was ingenious, and did great credit to the worthy inventor; and certainly deserved a better fate than it was destined to undergo.

" A third thrashing mill was invented in 1772, by two persons, nearly about the same time, and upon the same principles. The inventors were Mr. Alderton, who lived near Alnwick, and Mr. Smart, at Wark, in Northumberland. The operation was performed by rubbing. The sheaves were carried round between an indented drum of about six feet diameter, and a number of indented rollers arranged round the circumference of the drum, and attached to it by means of springs; so that, while the drum revolved, the fluted rollers rubbed the corn off from the straw by rubbing against the flutings of the drum. But, as a considerable quantity of the grain was bruised in passing between the rollers, the machine was soon laid aside.

" In 1776 an attempt was made by Mr. Andrew Meikle, an ingenious millwright, in the parish of Tyningham, East Lothian, to construct a new machine, upon the principles which had been adopted by Mr. Menzies, already mentioned. This consisted in making joints in the flails, which Mr. Menzies had formed without any. But this machine, after much labour and expence, was soon laid aside, on account of the difficulty of keeping it in repair, and the small quantity of work performed, which did not exceed one boll, or six Winchester bushels of barley per hour.

" Some time after this, Mr. Francis Kinloch, then junior, of Gilmerton, having visited the machine invented in Northumberland, attempted an improvement upon it. He inclosed the drum in a fluted cover; and, instead of making the drum itself fluted, he fixed upon the outside of it four fluted pieces of wood, which by means of springs could be raised a little above the circumference of the drum, so as to press against the fluted covering, and thus rub off the ears of corn as the sheaves passed round between the drum and the fluted covering. But not finding this machine to answer his expectation (for it bruised the grain in the same manner as the Northumberland machine did), he sent it to Mr. Meikle, that he might, if possible, rectify its errors.

" Mr. Meikle, who had long directed his thoughts to this subject, applied himself with much ardour and perseverance to the improvement and correction of this machine; and, after spending a good deal of time upon it, found it was constructed upon principles so erroneous, that to improve it was impracticable.

" At length, however, Mr. Meikle's own genius invented a model, different in principle from the machines which had already been constructed. This model was made in the year 1785; and in the following year the first thrashing machine on the same principles was erected in the neighbourhood of Alloa, in the county of Stirling, by Mr. George Meikle, the son of the inventor. This machine answered completely the wishes of Mr. Stein, the gentleman for whom it was erected, who gave the most ample testimony of his satisfaction, both to the inventor and to the public. The fame of this discovery soon spread over the whole country; and a great many farmers immediately applied to Mr. Meikle, desiring to have thrashing mills erected on their farms. The discovery, it appeared, would be profitable; and it was reasonable that the inventor should enjoy the profits of his invention. He accordingly applied for a patent; which, after considerable expence, arising from the opposition of some persons who claimed a share in the discovery, was granted.—These machines are now become very common in many parts of Scotland, and are increasing very considerably in number every year over all the united kingdom.

" We will now endeavour to describe this machine in its most improved state. The power employed for turning that part of the machine which separates the corn from the straw is produced by four wheels (when moved by horses), the teeth of which move in one another, and turn the drum, on which four scutchers are fixed. The sheaves are introduced between two fluted rollers, which hold them firm, and draw them in gradually, while the scutchers strike off the grain from the straw as it passes through. This will suffice for a general idea of this machine.

" The advantages of which are many. As the drum makes 300 revolutions in a minute, the four scutchers together make 1200 strokes in the same space of time. From such power and velocity, it is evident that much work must be performed (3). When the horses go at the rate of two and one third miles per hour, from three to six bolls will be thrashed; but, as the quantity thrashed will be less when the straw is long than when it is short, we shall take the average at four bolls.

" One gentleman, whose veracity and accuracy we can depend on, assures us that his mill thrashed sixty-three bolls in a day; by which, we suppose, he meant ten hours. To prove the superior advantage of this machine to the common method of thrashing with flails, a gentleman ordered two equal quantities of oats to be thrashed by the mill and by flails. When the corn was cleaned and measured, he obtained 1-16th more from the sheaves thrashed by the mill than from those thrashed by the flail. We are also informed, by another gentleman, who has studied this machine with much attention, and calculated its advantages with care, that, independently of having the corn much cleaner separated from the straw than is usually done by flails, there is a saving of 30 or 40 per cent. in the expence of thrashing.

" The number of persons requisite for attending the mill when working is six. One person drives the horses; a second hands the sheaves to a third, who unties them, while a fourth spreads them on the inclined boards, and presses them gently between the rollers; a fifth person is necessary to riddle the corn as it falls from the fanners, and a sixth to remove the straw*.

" This machine can be moved equally well by water, wind, or horses. Mr. Meikle has made such improvements on the windmill as to render it much more manageable and convenient than formerly; and we are informed many windmills are now erecting in different parts of the country. As to the comparative expence of these different machines, the erection of the horse machine is least; but then the expence of employing horses must be taken into consideration. One of this kind may be erected for £.70; a water-mill will cost £.10 more, on account of the expence of the water-wheel. A windmill will cost from £.200 to £.300 sterling."

OBSERVATIONS.

(1) This is the only account we have of a rubbing machine for the purpose of separating corn from the straw; and this shews us that the Romans had some idea of the propriety of that motion, and used it in the most simple way, by drawing the machine over the corn instead of making the horse work the corn over the machine. It is not improbable but their ideas might extend to this mode, though they might be deterred from using it by the same impediment that has baffled the modern mechanist; that is, the getting rid of the straw without injuring the corn.

(2) This must ever be of the first importance to a nation where bread is the Staff of Life. In a country like this, where the supports of life are not produced spontaneously, but by the exertion and industry of its inhabitants, how important and necessary must be the complete separa-

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* We add, on the authority of an experienced farmer, that of the six persons necessary to attend the thrashing machine, only two can in justice be charged to the account of the machine; namely, the person who manages the horses, and the one who feeds the machine: for, in the usual mode of thrashing by the flail, it requires the same number of persons as the thrashing machine does to clear an equal quantity of corn from the chaff in the same time.

tion and preservation of its staple produce. If a calculation can be formed from the number of experiments that have been made to prove what moiety of the produce is left in the straw, by being thrashed by the flail, we may, without exaggeration, set it down at a fifteenth part. This quantity should be deemed of some importance in the most plentiful years; but what must it be in the years of scarcity, when it requires more labour, from the bad quality of the corn, than it does in the more favourable seasons! Should not the uncertainty and fickleness of our climate, with the increased population, not only induce us to till to the best advantage every acre of our land, but to prepare and preserve its produce by the best and most certain means that the art of man can discover? Every farthing of cash that we send to other countries to purchase corn (that we might have produced and preserved in our own country) is a loss to the nation: it is not like the money we take to purchase the raw material of an article we can manufacture, the value of which we can enhance by our labour, and return to the world with profit. The present state of our manufactures shews us the validity of this, and proves to what a state of perfection we have got the manufacture of raiment over that of bread, by far the most important of the two: for how contradictory to nature it is to deck the body in costly robes when the appetite is craving food, which I am afraid was too often the case in the late scarcity. But I hope it has taught us a lesson, never to be forgotten in this country; that it has taught us the positive necessity of tilling those acres that have hitherto been held sacred to the mistaken advantages of commonage: for how derogatory to common sense must be the sufferance of useless herbage to occupy that soil, which would produce vegetables for the immediate subsistence of man! Many times have I seen the industrious efforts of the labourer checked in his attempts to employ his leisure hours in cultivating a few yards of the common to procure culinary vegetables, and thereby render his moments of recreation conducive to the comforts of his family; many times have I seen this laudable attempt, after much labour and exertion, destroyed in a few minutes by the perambulators on Holy Thursday for being an encroachment upon their unprofitable rights.

Can the fostering hand of the legislature do a more laudable act than to give to every man his rights in severalty, and thereby do away the greatest pest and nuisance in an enlightened nation—Commonage? the nursery of idleness! the promoter of feuds! the preventer of social intercourse! the destroyer of domestic peace! For what industrious man, that has the feelings of a parent, and whose situation is upon the border of a common, can withstand the temptation of cultivating a few yards of the waste, to add to the comforts of his family, though at the risk of having his labour destroyed for such encroachment? For, to be convinced of what importance a garden is to the working man, let us examine the environs of Birmingham; there we shall see the good effects of his employing his recreative moments, like the industrious bee, for the good of the community.

Let the advocate of commons take a retrospective view of Soho, the elegant seat of the industrious Boulton; there he will see the most gratifying sight that can be seen in these islands, A DESERT CONVERTED INTO A PARADISE; after which, I am persuaded, he will admit that a nation has not one mouth too many while it has one acre of land in a state of nature. Here he will see the industrious mechanic preferring with avidity the sweets of his garden to the noxious fumes of an alehouse, not only more conducive to the interest of his family, but to his own health, by inhaling a purer air, and refreshing his body by a change of exercise, by which he returns with double vigour to his vocation.

Here commerce extends her powerful arm to enrich and beautify the DESERT PLAIN, by throwing her redundant powers upon the highest branch of agriculture, which returns it back with incalculable interest, leaving the principal for a monument of British industry, and a proof positive that the most desert spot can be enriched by the plants of manufacture and commerce. May their influence extend to every common in the island, and root out the unprofitable plants that bring forth no fruit, to make room for those that would supply our markets, at all times, in proportion to the demand!—I hope these Observations will excite a fuller display of this subject by a more able hand: the field is large, and the honour would be great to any man that could point out the way to accomplish the general cultivation of our wastes.

October the 31st, 1796, to Mr. John Steedman, of Trentham, in the county of Stafford, a patent was granted for a thrashing machine, which was constructed with a number of flails fixed upon a cylinder, by the rotatory motion of which they beat the corn upon a circular floor, which had also a rotatory motion performing two revolutions in a minute. The machine was worked by a horse or horses.

A thrashing machine, with elastic flails, was invented by Mr. James Wardrop, of Ampthill, Virginia.

The machine, to be worked by two men, was made on a scale of a 12-foot flail, having a spring which required a power of 20 lbs. to raise it three feet high at the point; a spring of this power, raised three feet high, being found to get out wheat with great effect. The catches, or teeth, are strongly mortised into the wallower shaft, and placed round its circumference so as to make an angle one with another of thirty degrees. These catches, or teeth, take the lifters which raise the flails in an alternate manner; that is, three of the flails are operated upon with the whole power (viz. 20 lbs.), and are on the point of striking; three of them are two thirds raised, three of them one third raised, and three of them at rest; consequently the whole weight to be overcome is 120 lbs.

The lifters should be placed so as that a perpendicular from their lifting end would come to the middle of the flail; the rope should be fixed to the flail somewhat farther advanced to the end of it, that a proper tangent may be formed; the ends of the lifters, and the teeth in the wallower, should be rounded off so as to form a tangent with each other; the ropes should be fixed to the flails with a hook and eye, to take off when not at work; for some of the flails being always in a lifting state, their elasticity would otherwise be impaired.

The greater the length of the flails, and the higher they are raised, the more powerful they become; they act upon the floor with effect about one third of their length; consequently a flail twenty-four feet long will act on the floor with force eight feet; and this is the size of flails I would recommend in a horse machine. The floor is made of wicker work, through which the grain falls when forced from the straw.

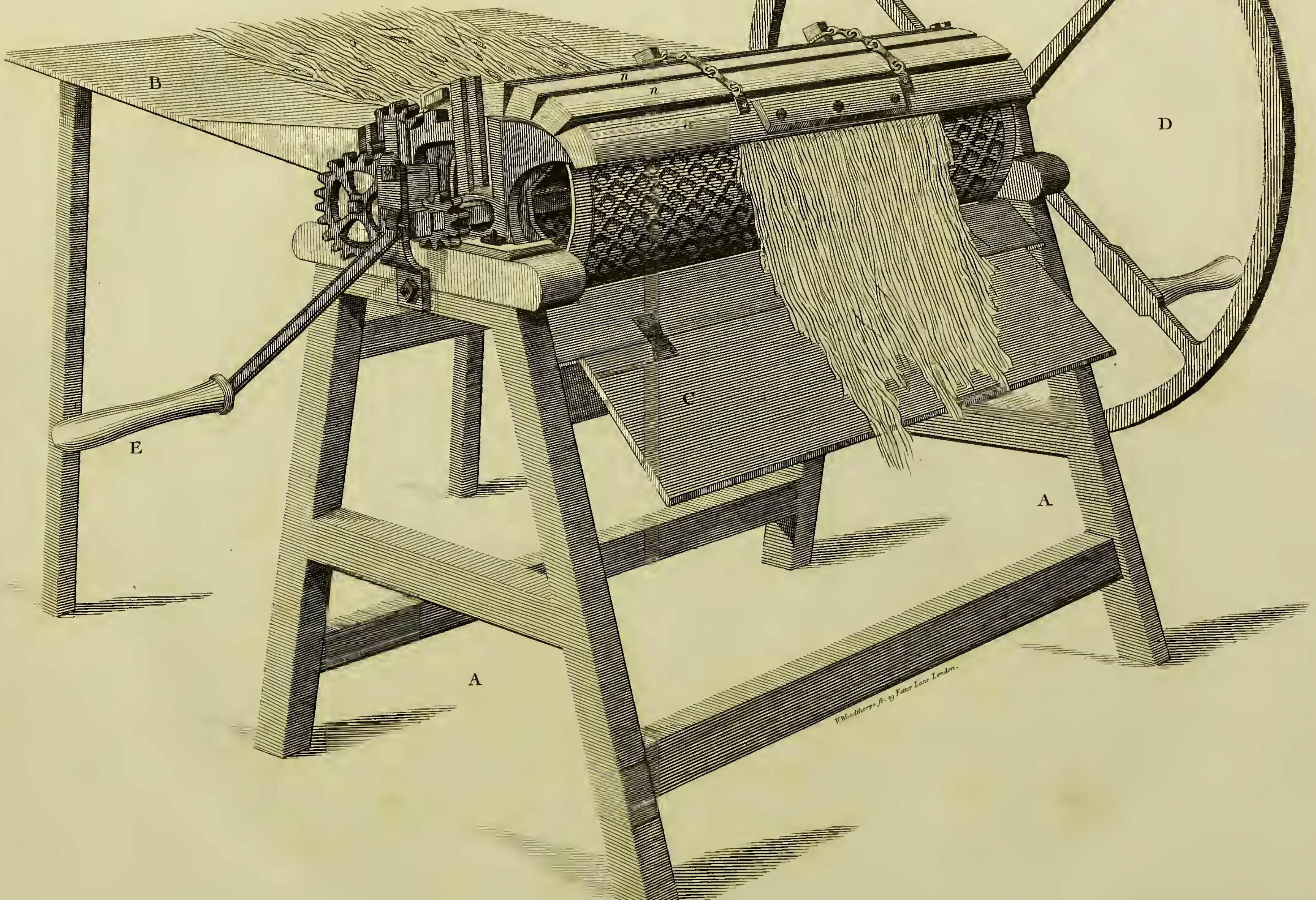
After having shewn the different attempts to invent machinery for the more complete separation of corn from the straw, the success and effects of which have been sufficient to shew the importance and practicability of the subject, I shall now endeavour, to the best of my abilities, to describe my attempts towards a further improvement, the success and importance of which may be judged from the following description and certificates.

Having duly considered the defects of the scutching machine, I was induced to launch into a new field of experiment in search of a new principle that would obviate the objectional parts of the old one, conceiving that the great power required to work the old machine arose from the great velocity required by the scutchers, and their beating the straw equally in those parts where there are no ears of corn, as much as where they are collected, consequently spending the greater part of their power uselessly, besides their beating the straw to pieces; I therefore concluded that a principle which would act upon the ears only would obviate this difficulty. In the course of experiment I found that two dull points, or two dull edges, coming in contact, would force out the corn without bruising it, from its flying off in a horizontal direction. On the introduction of this principle into an effective machine, I found great difficulty to discharge the straw and corn when disengaged from each other.

My first attempt to make a thrashing machine was, with regard to the feeding part, similar to my Patent Chaff Engine, protruding the straw in the same way alternately betwixt the strokes of the press, the bed being formed of chequered work of cast iron, the angles of the chequers obtuse, the press of the same form and substance. This, I found, would press out the corn without injury, but too slow to be useful. The idea then struck me, that the chequered work, converted into a cylindric form, with a rotatory motion, would carry the straw forward, at the same time receive the corn in the chequers, and throw it out without bruising. This I have found (after a multiplicity of very expensive experiments to obtain the proper size) to answer the idea to the utmost of my most sanguine expectation, constituting a machine of the greatest importance to the agricultural world, a machine that acts upon the ears only, and does not depend upon its velocity to disengage the corn effectually, and consequently can be worked by a small power. The difference betwixt this machine and the one in my first attempt consists in form and motion; the principle of action is the same, and shews that corn, from the convexity of its surface, will fly from the pressure of an obtuse angle without bruising.

This machine will not thrash so much corn in a given time as the scutching one will, when a great power is applied: it will only admit of a given power, more is useless, and that is moderate labour for a middling-sized horse, with which it will thrash from four to seven quarters per day, with the assistance of two people, which in my opinion is enough for the largest farmer, and more than any other machine has yet done in proportion to the power applied. Its portability likewise renders it more universally useful than any other machine; as it may (after once being erected) be removed from barn to barn with great facility, by reason of its different parts working by their own gravity, and not being confined either by bolts or screws, and that it may be erected in the open field as well as in the barn. Upon the whole, I presume its merits will appear more conspicuous, if I may be allowed the following observation, that it does its work effectually by sleight; whereas the scutching machine requires great labour, if worked by animated power; and consequently its attendant tear and wear, the disagreeable effects of moving great weights, cannot be avoided.

Lester's Patent separating Machine.



V. Woodthorpe, sc. 29 Fetter Lane London.

Pub. by Wm. Lester. Jany. 3. 1804.

This machine, from the small power required to work it, admits of being driven by a simple portable horse power machine, which will be found of the greatest use to every farmer, to drive a straw-cutter, corn-bruiser, dressing-machine, &c. &c. coming at a low price, and may be conducted by men of the meanest capacity. Of the importance of separating corn from the straw by machinery, the public may be convinced from the following experiments:—I have purchased trusses of straw in all the straw-markets in London, on purpose to re-thrash them, from which I have obtained from two to three pints of wheat per truss; amounting, upon a fair calculation, to upwards of 100 quarters per week throughout the year. What must be the amount of the loss in the whole kingdom? Enough to excite the serious attention of every agricultural mechanist, holding out a most interesting subject to draw forth the dormant powers of invention, and furnish him with argument to contend against the advocates of the old system, on the ground of depriving the labourer of his winter employ. I am persuaded there is more corn thrown into the yard with the straw, than would subsist all the thrashers in the country, and their families, the whole year; besides, the importance of having the surplus labour at command, for other purposes upon the farm, is too obvious to require any comment.

This machine has a very beneficial effect upon smutty wheat, by reason of its not breaking the balls; by which means they are completely separated from the corn, by the Winnowing Machine, without blacking its ends by the particles adhering to the downy part.

I shall here take the liberty to insert an account of some experiments made by me to discover the cause of this disease incident to wheat, with a view to adopt some mode to alleviate its effects, or to use some means for its prevention. Having formed an idea, from observation, and from what I had read on the subject, that the infection was communicated by contact with the seed, this led me to examine minutely the substance contained in the infected balls, before the highest magnifier of the best microscope I could procure; by which means I discovered that the dark substance which occupies the place of the farina consists of an immense number of globular particles, singly invisible to the naked eye, but before the microscope of the size, colour, and form of a small purple grape, with a luminous spot in the centre. This I concluded arose from the concentration of the rays of light in the middle of the particle, which induced me to suppose it contained a liquid substance. Such I found to be the case; and on pressing two of them with the point of a lancet, they burst, and emitted a liquid as limpid as water, which immediately united, forming one globule, leaving the bladders, with their fractures, visible. From this experiment I concluded that the liquid contained in these minute bladders was the infectious substance preserved in the downy end of the corn, and communicated in a certain stage of the plant. I presumed, if these bladders could be broken by art, at or before the seed was put into the ground, the atmospheric air would destroy the infection before the corn began to vegetate.

To prove that the infection is communicated by the seed, in the year 1798 I sowed wheat after several different modes of preparing the seed. No. 1, clean seed, made black by rubbing it with smut-balls just before sowing, the produce of which was nearly all smut; No. 2, a portion of the above blacked seed exposed one minute in boiling water, the produce of which was perfectly clean; No. 3, a portion of the above blacked seed washed clean, by rubbing violently with the hand upon the bottom of a fine sieve on the surface of a tub of spring water, the produce of which was perfectly clean. The labour of rubbing was great, owing to the black powder adhering to the downy ends of the corn.

After these experiments I took some smut-balls, and immersed them in boiling water one minute; I then placed some of the particles before the microscope, and found them burst, and nothing but the empty fractured bladders left: in consequence of which I sowed eighteen acres of wheat, the seed of which was exposed one minute in boiling water, and immediately spread thin upon a floor, the produce of which was perfectly clean: but a farmer in the neighbourhood, attempting to follow the same mode of preparing his seed, either from his keeping it too long in the boiling water, or his laying it too thick on the floor, he lost his whole crop; which proved the practice to be dangerous in unskilful hands.

From the variety of experiments that have been made to discover the cause of this malady, incident to this valuable plant, it is proved the infection is communicated by the seed: its external form renders it very difficult to disengage and separate the particles of the infectious matter from the sound corn, owing to their fibrous downy ends, which hold the particles as if they were inclosed in a net. By exposing this downy substance before a high magnifier, it appears like a gooseberry-bush; and if it be darkened by the particles of smut, they appear in clusters, like bunches of small grapes. There is one thing very much in the favour of their separation, when disengaged from this fibrous substance; that is, their gravity being much greater than water; which may be seen by taking a wine glass of spring water, and breaking a smut-ball betwixt the thumb and finger over the surface. The particles, when disengaged from the ball, float for a moment, till immersion takes place; but the instant they become immersed, they sink with rapidity to the bottom.

The gravity of this substance being greater than water, it only remains for art to destroy the fibrous part without injuring the corn; and this should be done on the surface of water, that the particles might fall away as the disengagement took place. For this purpose I would recommend a hollow cylinder, of a peculiar form, which I shall describe more fully hereafter. This cylinder should contain about 30 lbs. of wheat, and be turned slowly round upon the surface of a tub of water; by which means the downy net-work would be sufficiently destroyed to let go the particles without injuring the corn. Two tubs might be used, and the water changed occasionally; but the best way would be to turn the cylinder on the surface of a running stream, whenever it is at hand.

Where the thrashing machine is used, a few turns would be sufficient, owing to the balls not being broken.

The time may not be far distant, when, by the general use of the thrashing machine, and a careful attention in washing the seed, this destructive malady may be totally destroyed. We may have this hope from having discovered the cause of the disease; as it is far different from the blight or mildew; not, like that, depending on the state of the atmosphere, and attaching itself to the straw; by which means it robs and impoverishes the seed.

Query. Is not the mildew a plant of the fungous kind, that flowers and brings forth its seed, attaching itself to the straw; which is predisposed, by a certain state of the atmosphere, to give it nourishment, and thereby rob the parent plant of the nutriment that should perfect its seed?

We know that many trees and plants are the *matrices*, out of which other plants grow; and in proportion to their health do they give more or less nourishment to this minute vegetation. This is very visible in our fruit-bearing trees. Those scions that have the clearest bark, and are the freest from moss, always bear the largest and best fruit. It is with the vegetable as with the animal tribe, whatever checks or draws off the nutriment appropriated for them by nature, must in the end deprive them of those means by which they alone can arrive at perfection. It is very obvious, that the innumerable variety of mosses and funguses, attaching themselves to trees and plants, have a similar effect to the insect and vermin tribe attached to the bodies of animals; but there is a predisposing cause, that prepares food for vegetable or animal life; and in proportion as that food is supplied will be the increase of life. It is also very obvious, that a certain peculiar state of atmospheric air prepares the straw of wheat a food for mildew; for there are certain situations where it is more destructive than in others; which may arise from the inequality of the surface of the earth causing different motions and qualities of the air, by which means producing different effects upon vegetation, similar to what it does upon animal life, beyond the controul of the aspiring art of man, and which must be left to the ALLWISE CREATOR, PRESERVER, AND REGULATOR OF THE UNIVERSE, who has given to matter that vivifying power, that the decay and dissolution of one object immediately becomes the food of another.

After having made the above observation on mildew, I hope I shall be excused a few remarks on the effects of it on the wheat crop of last harvest, 1804. I travelled through most of the corn counties in the month of harvest, and do not recollect ever seeing the wheat so dark on the straw when the weather was so dry, which will most certainly injure the quality as well as shorten the quantity of the corn, and consequently enhance the price. The appearance of the arable lands this autumn is a proof that the generality of farmers are actuated by one idea; for, owing to the low price of corn last year, and the high price of meat, they have thrown their land into pasture. I believe there is at this moment the greatest breadth of young clovers ever known at any one time, and the finest plant I ever saw; which I am fully convinced will advance the price of corn, and perhaps too high, if we have not very productive harvests; for farmers in general are governed by the appearance of the present moment, not being in the habits of speculation beyond the province of their own farms. They do not look at the effect their present actions may have upon the future; being actuated, like other men, by self-interest, they look to that mode that holds out to them the quickest return; and which is, of all others, the greatest good to the community, when not carried to an extreme. But the recent shock in nature, the late scarcity of the wheat crop, has caused an unprecedented breadth of land to be brought into tillage; the consequence of which, with a couple of good seasons, will be, to overstock the market, and bring the price below the rate, in which, the present times, will allow the farmer a fair profit; and which will be apt to make him run into the other extreme, by too hastily turning his land into pasture, and probably cause a temporary rise in the price of corn.

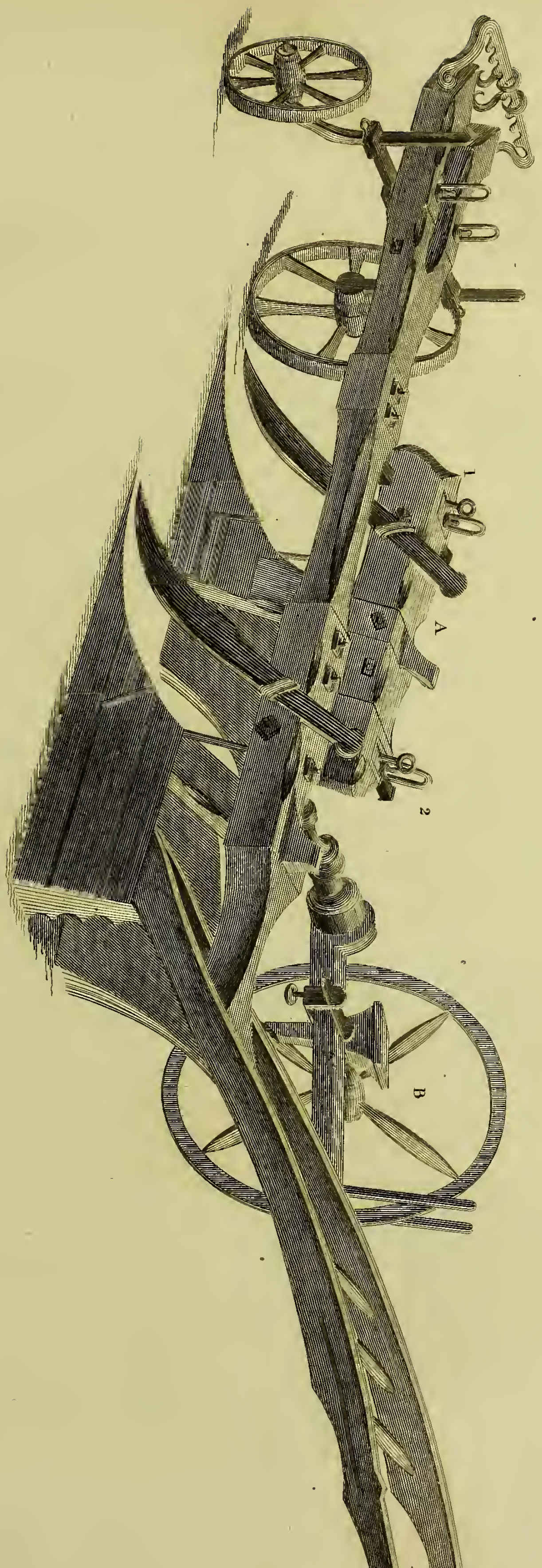
This is what must be expected after every great deficiency in nature that materially affects the price of provisions, unsettling the minds of men, giving them vain hopes and high expectations, and producing their consequent disappointments; and this will ever take place till things get into a settled track; by which means only the markets will meet with a regular supply, according to the demand.

PLOUGH.

THE great variety of Ploughs used in different counties, upon lands of the same tenacity, is a proof of the exertion of genius to overcome the prejudiced practice and habits of ruder ages, though several of the variations are nothing more than an addition of superfluous matter, without any alteration of principle. The process of moving the earth is of such a simple nature as not to require a great number of different ploughs, as all that is required for the purpose of tillage consists within the narrow compass of the two following particulars: first, to break the contact of the earth, and completely turn it over when broken; and, secondly, to move the soil completely when in a disjointed state; which one species of plough is ever competent to do: and there are only two different degrees of cohesion that require as many different ploughs to break the contact. The first is, all tenacious soils, rendered hard by the powers of the sun, and the particles of which are more closely united by repeated crops. This quality and condition of soil, of all others, requires the strongest plough to fallow it to the greatest advantage, which is when the earth broccles or flies from the mould-board in the form of small clods. The best plough for this purpose is very much in use upon the clay farms in the midland counties, and is a very simple, cheap, and effectual implement, consisting of a straight beam of ash with two handles, a stout sheath and head of the same wood, the mould-board of elm, without any curvature, forming the diagonal side of the half of an obtuse triangle, the share weighing from 18 to 24 lbs. Sometimes a wheel fixed immediately under the beam, and sometimes a foot, is used to prevent the adhesion from drawing the plough too deep. A foot, which is simply a bar of iron beat flat at one end and turned back, the other end fixed in the beam with a wedge, is preferred upon stony land, by reason of its moving the stones on one side, when the wheel would run over them, and throw the plough out of the ground.

The next degree of cohesion is where the particles of the soil are held in contact by the roots of grass or weeds. The best plough for this purpose depends upon the mode by which the seed is intended to be put in the ground. If by broad-cast, the Dutch, Rotherham, or Small's plough, with a curvature of the mould-board not less than 40 degrees, leaving the flag or furrow with an aris edge uppermost; but if by drill or dibble, the mould-board and breast should be made as convex as the other is concave, by which the flag or furrow will be laid flat, which would be by far the best, if the drill was so far improved as to deposit the seed in the centre of the flag at the very time of ploughing, which I have no doubt will be accomplished; and not till then will the drill system be brought to perfection. Then will the flat furrow always be preferred, owing to its most completely burying the grass, by reason of its laying the greatest quantity of earth on the right side of the fulcrum or bearing edge of the furrow, by which the seams are more completely united.

For moving the soil in its disjointed or broken state, light ploughs, of almost any description, will suffice. The two-furrow plough may be used to the greatest advantage for this purpose, and likewise upon most of those soils whose contact arises principally from the roots of grass. The principal objection to the two-furrow plough is from its not laying the furrows even: to obviate which, I have invented a mode by which one plough is raised out of the ground, by means of screws, in proportion as the land lies in an inclined situation. The Plate represents a two-furrow plough, with this new mode of attaching them together, with a turnip-drill fixed to the beam; letter A the attached plough; B the turnip-drill; figures 1, 2, the screws by which it is elevated or depressed. The coulters are fixed on the outside of the beams with a bolt nut and screw, by which the accustomed mortice is dispensed with, which always weakens the beam in that part where the greatest strength is required.



1
A
2
B

HARROWS.

SINCE having described this implement in my Essay to the Board of Agriculture, a publication on Implements has been presented to the world, which renders it indispensably necessary for me to make a few observations on the subject: the book is entitled, PRACTICAL AGRICULTURE; OR, A COMPLETE SYSTEM OF MODERN HUSBANDRY. BY R. W. DICKSON, M.D.

I shall take the liberty to quote a few lines from this *modern* Work, on which I shall also make some observations, by means of which the practical abilities of the Author may be appreciated; and I presume to shew that the addition of the syllable UN to one of the words in the title-page would have rendered it more appropriate.

At pages 23 and 24, " Implements of this sort are not only useful, but particularly necessary in the practice of husbandry, both for covering the seed and preparing the land for its reception, though they have yet undergone but little improvement. The chief circumstances in which they have been rendered more convenient, are in the position and mode of fixing in the teeth, the direction of the bulls, and the manner in which the horses are attached to the implement."

The above is a contradiction in terms, and shews that the author is totally ignorant of the subject on which he writes. By this effort at description he renders darkness more dark. In the first place he asserts, " they have yet undergone but little improvement;" which fully shews his confined knowledge of what is passing in the agricultural world. He then immediately contradicts that assertion, by pointing out the very circumstances in which they have been rendered more convenient; " by the position and mode of fixing in the teeth, the direction of the bulls, and the manner in which the horses are attached to the implement." This, in fact, is all that is necessary or practicable in the improvement of the Harrow. As a farther proof of his incapacity, at page 565, on Couch, " Weeds of these kinds are only capable of being completely removed and destroyed by having them drawn out while the land is under fallow, by means of heavy harrows, constructed for the purpose, with a greater number of teeth or tines than is necessary for those of the common sort, and placed so as to incline more forward."

These are the wild conclusions of theory, which practice fully contradicts, and proves that the fewer teeth there are in the harrow the more effectually will it draw out the couch, and the more perpendicular their position the better will they discharge it when drawn out: it is the province of the harrow to raise the couch to the surface, and separate it from the soil, but that of a couch rake to collect it; therefore the most improved harrow will always discharge itself, or, in other words, it never will collect the couch, and consequently never require lifting up. If the teeth stand too close, it drives the soil on heaps, and works itself out of the ground, by reason of which it cannot raise the couch effectually. The Patent Harrows, the theory of which the Author of the above work well knew, and from which he drew the conclusion which contradicts his first assertion, are constructed upon those principles that constitute a perfect implement for every purpose required. In Plate 5. is a perspective view of the Patent Harrow. A the drawing-tree, which has two hooks fixed to the centre line of each harrow, and drawn by a third, which prevents any obliquity in their motion, so that no one tine is drawn in the track of another. B B the bulls, the form of which admits of the most proper arrangement of the teeth. C C the tracks of the teeth, which are at equal distances from each other, yet so near together as to move the soil at once drawing over the land; and from their position, and the diagonal arrangement of the bulls, they never drive the soil on heaps, or ever want lifting up upon the foulest land. The motion they give the earth, which commences in the centre, and continues in a line with the bulls to the outside, carries off all substances that have an aptitude to hang on the teeth. Harrows of different sizes, and different weights, are calculated to harrow all kinds of land, in all its various states; from the peculiar motion they give the soil, they cover the seed more effectually at once passing over the land than any other harrows do at twice. Vide the Certificates.

CULTIVATOR, SCUFFLER, OR SCARIFIER.

BEFORE I make any observations on this implement, I shall again make a quotation of a few lines from Dr. Dickson, in order to elucidate its use. Pages 358, 359, 360, on fallowing of Land: "In the preparation of land for the reception of grain, or other sorts of crops, by repeated ploughings, or the frequent exposure of new and fresh surfaces to the action and influence of the atmosphere, a variety of alterations and changes are produced in the earthy as well as other kinds of materials that enter into the constitution of the soils. The heavier or more earthy particles of the land, by being under different circumstances of the air and seasons, thus frequently stirred and turned over, are so effectually divided or separated from each other, and broken down, that even in most of the stiffer sorts of ground, as well as those of the lighter kinds, there is a degree of pulverisation and mellowness effected, that could scarcely have been induced by any other means; in consequence of which, the portions of vegetable matter that are present, and that may have been reduced into the carbonaceous state, with the calcareous, the argillaceous, and other earthy ingredients, and such metallic substances as may exist in the condition of oxyds or calces, become so uniformly and so extensively blended and incorporated, and the manures that are afterwards applied so minutely intermixed with them, that the fibrous roots of the growing crops, of whatever nature they may be, are enabled to penetrate and extend themselves more fully, and of course to draw more regular and varied, as well as more abundant supplies of nourishment.

"Besides, on account of the extreme division and pulverisation that takes place, and the great irregularity of surface which is produced in this way, the dews and light refreshing rains that are so frequently occurring in the early spring months are more capable of being admitted, and diffused through and detained, in the hollows and interstices of the ground, and thus to contribute powerfully to the crops in the more incipient stages of vegetation.

"By the repeated turning-in and destruction of different sorts of plants of the weed kind, much vegetable mucilaginous and saccharine matter may also be added, as well as the land improved by the putrefactive fermentation that must from these causes be constantly taking place.

"There are also other modes in which advantages may be gained by the repeated turning over and breaking down of the particles of soils, as, from much of the atmospheric air being by such methods of husbandry blended with the fine particles of soils, and detained in the numerous hollows and cavities formed by such degrees of pulverisation, a larger proportion of oxygen may be supplied, which, by its union with the carbon and other inflammable materials that are mostly contained in soils, may produce the carbonic or other acids, according to the circumstances of the cases, in greater abundance, and in this manner aid the growth of vegetables in a high degree. And, as the water or moisture that is included in large quantities in the pores of soils in such powdery states may undergo the process of decomposition more fully, by coming more minutely in contact with the portions of atmospheric air that are covered up and imprisoned with it in them, the supplies of ammonia or volatile alkali, by the combination of its hydrogen with azote, may be more regular and more copious, as well as those of nitre, by the more complete union of its superabundant oxygen with some other portion of the abounding nitrogen or azote of such air.

"It has likewise been suggested, that, as the atmospheric air consists or is constituted of oxygen, azote, and the fluid matter of heat, if the heat that causes them to exist uncombined, in the form of gasses, be drawn away from them by some other material, while they are confined in the cavities of the soil, they by their nearer approach to each other combine so as to produce nitrous acid, or the oxygen in its fluid state, not in its aërial one, may more readily unite with carbon, and thus constitute a fluid, not an aërial carbonic acid, which is supposed to be of great utility in promoting the growth of plants. And further, that if any process of the putrefactive kind be going on where atmospheric air is in this way confined in the interstices of the soil, and by the deprivation of its heat is converted from a gas to a fluid, the azote may combine with the hydrogen of the decomposing water, or contribute to decompose it, and in this manner form volatile alkali, which, like nitrous acid, may either during the process of its formation, or after that has been completed, be of very material utility in promoting vegetation; while at the same time the oxygen afforded by the decomposing water may, like that of the atmosphere, contribute to the production of the carbonic, nitrous, or phosphoric acids, and in this way render carbon, phosphorus, and the basis of nitre, capable of being taken up by the absorbent roots of growing plants. From the great diminution of bulk that has been found, from experiment, to take place where atmospheric air is confined in contact with water, it is conceived that there may be a decomposition of both the water and the air, and a production of both ammonia and nitrous acid, which are known to be beneficial in promoting vegetation."

What is the practical farmer to gather from this? It may be a subject for the criticism of the analyst and chymist, or swell the volumes of the bookmaker; but to the farmer it can be of no use, being entirely beyond his comprehension, and what his practice in a great measure refutes, particularly that part of it, " the frequent exposure of new and fresh surfaces to the action and influence of the atmosphere." Numbers of visible instances present themselves in the practice of agriculture against the propriety of such exposure: it is obvious to the meanest capacity, that the more the surface is covered, the more the earth will be fertilized; and that if it were possible to give the soil that mechanical arrangement so necessary to the well-being of our cultivated plants, and at the same time eradicate the weeds, put in manure, and the seed, with the least possible exposure of fresh surfaces, it would be the greatest desidertaum in agriculture; and consequently those implements that tend to produce that effect must be of the greatest importance.

I shall here note a few particulars wherein the effects of fertilization acquired by the non-exposure of surfaces is most visible to the senses, without entering into analytical conjectures on the invisible operations of nature in the formation of the food of plants, a subject in my opinion beyond the comprehension of farmers, and which consequently can be of small service to practical husbandry.

It is a known fact, that, where the earth has been covered for any length of time by any substance that would exclude the sun and atmospheric air, such as hay-ricks, corn-stacks, faggot or furze piles, nay, even heaps of stones, though all the remains of such substances be carried away, the earth becomes fertilized, and produces a more luxuriant vegetation than upon the best and most regular cultivated field. Several instances of this kind have occurred to me in my own practice; one of which I shall describe. I once laid down about twenty loads of stones, that had been gathered off the land, in a part of the field where I intended to make a pond, the stones being for the purpose of paving the bottom; but before they were used I fixed on a more convenient place, and removed the stones thither: after these stones had remained about eighteen months, the spot on which they lay was then sown with the rest of the field which had been properly cultivated, and to my no small surprise the crop was by far more luxuriant, upon that spot, than in any other part of the field. The following autumn I sowed five acres of winter tares upon a bean eddish, the half of a ten-acre piece. The other five acres I summer fallowed, giving it four ploughings. The tares were fed off by sheep being penned upon them in the day-time, and folded upon the fallow land at night. The tares were consumed by the beginning of August, and the land ploughed up and well cultivated, except manure, of which it did not receive any. The crop of tares was very large, and a considerable refuse was left by the sheep. At the beginning of October the whole ten acres were sown with wheat. The land was of an equal quality. The beans, the year before, were a fair, regular, and even crop. The young plants of wheat appeared upon an equality till May, when the five acres, after the tares, took the lead, and kept it in point of luxuriance through the summer. At harvest I put the wheat in two different barns, and took an account of their respective produce, which was twenty quarters from the five-acre tare piece, and twelve quarters four bushels from the five acres that were summer fallowed and folded. The sheep that eat off the tares were folded every night upon the summer fallow: therefore, from what cause could this extraordinary fertilization be acquired but from the shading and covering the surface of the soil in the warm summer months? The utmost the farmer can do is to judge the cause by the effect, and direct his practice accordingly: therefore it must be his interest to use such implements and modes as will cultivate his land to the best advantage.

The Cultivator is the best known implement for tilling the soil with the least possible exposure of fresh surfaces to the sun and atmospheric air, as it does not turn the soil over like the plough, although it eradicates weeds and pulverizes the soil most effectually. Its good effects are not enough known in the agriculture of this country. Its effects, for the purposes to which it is intended, are nine times out of ten equal to those of the plough after the contact of the earth is once broken; with this advantage, that it will cultivate five times as much in a given time with the same power. Of what importance must this be to the farmer that wishes to till his land seasonably? A green fallow is rarely seen in those districts where this implement is in full use.

When the good effects of an implement become known, an enquiry immediately takes place to ascertain which is the best of the kind; and, as it is necessary to know what are the qualities that constitute a good one, I shall therefore take the liberty to describe what in my practice those qualities appeared to be, as there has been a number of implements constructed for this purpose, of various forms, but most of them have run into an error, by crowding the shares or hoes too near together, from which cause they choke or drive the soil on heaps upon foul land; to obviate which, I have invented one, upon a new and useful construction, that will work free upon all lands without ever driving the soil. See Plate 5.

A, the principal beam. B, B, the handles. C, C, the regulating beam, by which the implement is set to all the variations of soil. D, D, the expanding beams, in which the stems of the shares are fixed, and which expand and contract from the centre E. F, the form of the shares, that may be varied at the will of the farmer. G, G, G, the wheels that regulate the depth. H, the hook by which it is drawn.

This implement, from its compass-like form, works fast and steady upon the land, without driving the soil. If set at the proper expansion, from its form, it also cultivates ridges of the acutest angle with the same facility as it does the most level surface, and may be worked at any depth from one to eight inches. It is an excellent horse-hoe, by reason of its working so fast to the ground, which is owing to its form, one share drawing in another, and whose depths are regulated by the wheels.

DRILLS.

We have no implement of this description that has all the requisite qualities to constitute a perfect drill. In my opinion, one of the best qualities it can possess is what they all of them are deficient in, namely, to deposit the seed in the very centre of the flag or furrow, without breaking its surface. This, however difficult it may appear, I flatter myself will ere long be accomplished; then may every kind of soil be drilled to the greatest advantage with the fullest effect of the dibble, without being liable to its objections. Could this effect be simply obtained, it would be the best of all possible modes hitherto known for depositing of seed corn.

Plate. 5

Lester's Patent Harrow.

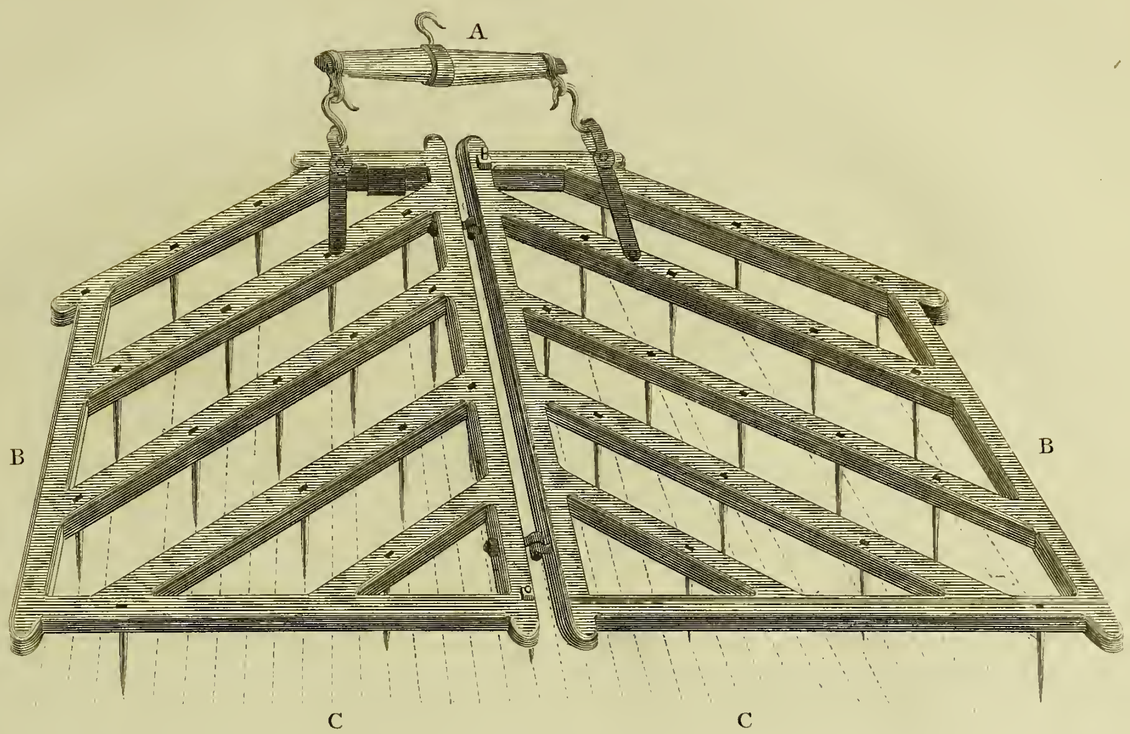
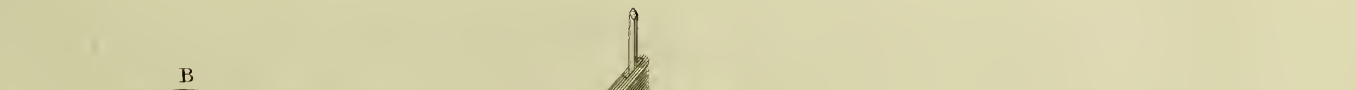


Plate 6

Lester's Cultivator



V. Woodthorpe sc. Fetter Lane London.

Pub. by Wm. Lester, Jany. 3. 1804

WINNOWING MACHINES.

These articles are not yet arrived at that state of perfection that could be desired: but those of the best construction are greatly preferable to the old mode of separating corn from the chaff; though they would be much more desirable, if they would perform the whole work at one operation, taking the horns or beard from the barley, and the chaff that adheres to the wheat, without the assistance of sieves of any description. Vide the Patent Separating Machine.

CHAFF ENGINES.

Though I have given a full description of this engine, I think it my duty to make a few remarks on the ludicrous description given by Dr. Dickson of this useful machine, at page 32:—" Of these useful implements there is a great variety, formed on very different principles. There seems, however, in general, to have been too little attention paid to their construction, as there is scarcely one so cheap as to be suited for general use."

And again, in a few lines afterwards, he makes the following observation:

" As the principal objects aimed at in this sort of machine are those of expedition, and the lessening of labour, it is obvious that many of the improved instruments of this kind must answer these purposes much more effectually than those that were formerly in use."

And, in his additions and corrections of the above, at page 585, he has given us a specimen of his mechanical abilities.

" A wheel with two knives fixed on its radii will, however, it is believed, cut more straw in a given time, and with a given force, than a wheel with three knives; as where there are three knives one of them is always upon the straw: the resistance is of course so great and constant, as materially to diminish both velocity and momentum, and consequently power. Mr. Burrel, of Thetford, in Norfolk, we believe, has attached to the side of these machines a crank, which, by means of a spindle terminating in a cog wheel, much assists the primary force. Two boys or women are capable of turning this wheel for many hours together. It is probable that the application of a multiplying wheel to these machines would much facilitate the labour of them."

The Doctor, from the above, appears to be almost as good a mechanist as he is a practical farmer; and it is probable, if his ideas were put in practice, they might perhaps produce a perpetual motion.

He says, " that a wheel with two knives fixed on its radii will, however, it is believed, cut more straw in a given time, and with a given force, than a wheel with three knives."

It is believed !—So that it is not an opinion of his own, but of others, and is consequently of more importance; for there is a probability that, amongst the number, there may be some who, from their experience and mechanical judgment, have formed a just idea on the subject.

" As where there are three knives one of them is always upon the straw, the resistance is of course so great and constant as materially to diminish both velocity and momentum, and consequently power."

Had the Doctor possessed the smallest ingenuity, or the least knowledge of the mechanical effects of the fly, he would have found that, by a parity of reasoning, one knife fixed on the wheel would have cut more than two with the same power.

" Mr. Burrel, of Thetford, in Norfolk, we believe, has attached to the side of these machines a crank, which, by means of a spindle terminating in a cog wheel, much assists the primary force."

But he does not tell us how much it diminishes the time, nor what quantity of work it will do; consequently there is no information for the public, except " that two boys or women are capable of turning this wheel for many hours together."

If one of them could have turned it the same time, there might have been some advantage gained in point of labour.—Another trait of his mechanical probabilities shall close this subject.

" It is probable that the application of a multiplying wheel to these machines would much facilitate the labour of them."

Another step towards the discovery of the perpetual motion. If he could get rid of friction and gravity, he might perform wonders. What a pity it is that paper and time should be wasted on such obsolete remarks! If he had been vigilant in his researches, he might have obtained real information, and yet have been more concise.

I shall quote a few more lines, and then take leave of this practical Work, which exhibits no bad specimen of the Author's avidity in the art of book-making.

Page 564. " Cockle. There are two sorts of this weed, the common and ear cockle. The latter, according to a late practical writer, varies from the former in being considerably smaller in size, and by its peculiarity of growing within the ear of the wheat plant; in some instances the whole ear affording no other produce than this, while in others one part of it contains perfectly-formed wheat, and the other ear-cockle. It is asserted, on the authority of much observation, to be a degeneracy in the wheat from its being too frequently sown on the same land from which it was produced. If this be the fact, the remedy must obviously consist in a frequent change of seed."

Is it possible that this can be written in this enlightened age, by an M.D., the Author of a practical System of Agriculture? In no one instance has the Doctor exposed his farming incapacity in so flagrant a light as this. The practical farmer will infer from this that the Doctor never saw wheat grow: he certainly never saw it grow with the eye of a naturalist; and I much doubt whether his practice ever went beyond the province of the desk, or he never could have inserted such an inconsistency, an idea that never could have originated but in the darker ages, when he says, " If this be the fact." His credulity displays a very confined knowledge of things, even to suppose the probability of the seed of one plant degenerating into that of another. If he had employed his pen in giving the best information extant, without combining with his partial and reserved descriptions exploded and incongruous ideas, which render what he has written in some measure unintelligible, his voluminous work might have been of some use to the practical farmer; he had succeeded, had he candidly given the most improved practice of modern agriculture, instead of plunging his reader into an ocean of inquiry, to select the few useful hints that are not to be found in other books of less price; subjecting him to the same predicament as the dog with the shadow in the fable.

A Complete System of Modern Husbandry should be select, and not compiled with the exploded practices of former times; which only shews the book-maker more conspicuous than the practical farmer. Books on agriculture, in an improving country, are something like old almanacks; after a certain period, they become obsolete, and rather mislead than inform, except they convey the recent improved practice from province to province, and this more particularly with regard to implements for the abridgment of labour, which is of more certain and universal importance than the crop arrangement, which must ever depend upon the quality of soil, situation, and other local circumstances, forming a constant bar against one general practice.

I shall here make an observation on one of the most important subjects in the agricultural world, a plan adopted for facilitating the more immediate circulation of agricultural knowledge, by that noble and liberal patron of the art, the late Duke of Bedford, and carried on with the most laudable and persevering exertion by his noble successor, the present Duke, at his hospitable mansion, Wooburn-abbey, in Bedfordshire. Here the most interesting minutiæ of the science are exhibited in practice, at an annual appointed time, before the first amateurs, assembled from every part of the agricultural world, where they reciprocally communicate to each other the practice of their different countries, at the time they are treated with the most unbounded hospitality at the noble Duke's table, facilitated by the opportunity of an ever-changing agreeable mixed company, where they not only communicate any new fact in the art, but are stimulated to put in practice the information they have obtained on their return to their own farms, by which means useful knowledge is more speedily and effectually circulated than by all the books that were ever written on the subject; for it rarely happens that the writers on agriculture are the best practical farmers, the greatest part of them being merely book-makers, or the hireling writers of booksellers; which, compared with the meritorious plan adopted by the late noble Duke of Bedford, is like the shadow compared to the substance, besides the more immediate stimulus of the successful candidates for the prizes, which are distributed with the most munificent liberality, causing a laudable exertion amongst the farmers, never before known in this country. This plan has been adopted to a great extent, and carried on with the most laudable and liberal exertion, by T. W. Coke, Esq. on his extensive domain at Holkham, in Norfolk: and by the noble and patriotic Lord Somerville, whose annual meetings are held in London, and whose zeal and perseverance for the improvement of agriculture are not exceeded by the greatest amateur of the age. When property and ability are thus united in their exertions to improve and ameliorate the state of man, happy is the country, and doubly happy the age, that enjoys the good effects of the united exertions of the best benefactors of mankind; for such will they ever be deemed, to the remotest period of time, who, by their example and perseverance, have laid the foundation of a plan, the completion of which will convert all the desert wastes into useful fields, thereby fulfilling the command of the Creator, when he said unto man, Go forth and multiply.

DRAINING, OR MOLE PLOUGH.

The utility of this implement is very much confined, though on its first introduction it excited much interest in the grazing counties. On its application to draw off surface water from retentive soils in pasture, its effects were very obvious, though in time subject to many objections, on the account of the liability of the drains choking by an innumerable set of causes, from the changeable variety of subsoils. Whenever the mole was drawn through a vein of sand or gravel, it, in a short time, choked the drain, and threw the water upon the surface. Upon clay subsoils, free from those veins, its best effect arose from the slit made by the coulter to which the mole is fixed, through which the water percolated into the arched cavity made by the mole ; but as this slit in time became closed, either by the treading of cattle, or the re-uniting of the earth by any other cause, the drains became, in a great measure, useless. These effects are very obvious, from the mechanical operation of this implement, which held out such plausible advantages on its first introduction, and which required time and reflection to prove the substantiality of its effects. Reflection did point out to those persons that knew the effects that water had on the mechanical arrangement of soils, that if a cavity was made by a bar of iron, or any other substance, through a bed or stratum of clay, without fracturing its surface, that in such case water would not enter it by percolation ; consequently all the good that can be derived from the use of this implement, must arise from the slit made by the coulter to which the mole is attached, which, when that is closed, the good effect must cease.

The importance of taking away the superabundant surface water, both from pasture and arable land, is so obvious to the interests of the farmer, that every new and effectual mode that tends to facilitate that desirable purpose is sure to meet with the warmest patronage, whereby the value of land is, in many instances, more than doubled. Much has already been laudably and very judiciously done to discharge springs and subterraneous waters from lands, by various modes of covered drains; but all the kinds of covered drains, hitherto used, have been very ineffectual for discharging the water from the surface of retentive soils. A covered drain of any kind has, in most instances, proved inadequate for that desirable purpose, by reason of the continuity of such soils preventing the percolation so necessary for the desired effect. Many have adopted open drains upon pasture land, and with very good effect for a short time; but they are objectionable on two accounts: first, the waste of herbage; and, secondly, their liability to be closed up by the feet of cattle, and, consequently, require re-opening. The arable land is either laid up in ridges wide or narrow, according to the custom of the country, or open drained by the spade after each ploughing: both which modes are to answer the same necessary and desirable end—the discharge of surface water, the superabundance of which is so injurious to vegetation in this climate. This variety of modes, subjecting us to the constant repetition of the same thing to acquire one and the same effect, shews our inattention to this important art. Let us consult Nature, and take a lesson from her arrangement of the mundane system. Let us for one moment reflect how the waters percolate upon the earth, by that rule conduct our practice, and adopt a permanent mode, by assisting Nature to discharge her superfluous waters from our lands, by one certain and invariable process, that may stand effectual for the benefit of our childrens' children, without being subject to the constant repetition of doing that continually which, to prevent a waste of labour, we may do at once for a perpetuity. Let us take for example the Indian and his tank, by which he collects and reserves the waters of the earth to replenish and nurture his rice plants. What to them is food, to ours in the same proportion is poison. We have, therefore, only to reverse his mode, and we shall thereby acquire as lasting and as perpetual an advantage. We have the same materials for our purpose that he has for his; they only want to be raised and applied to produce the same lucrative effect. Nature and experience have taught him not to build his tank with a substance through which the water would percolate: then by what rule should we cover our surface drains with a substance that will prevent all percolation? He only makes use of a species of earth, whose interstices are too small to admit water; we should make use of a species that would form interstices so large as to let water pass freely, without impeding the plough, or preventing the growth of grass. Our drains should work as freely as the blood in the veins of the human body, we should then always have our land in a healthful state. I have very often seen drains wherein (immediately after the stones or bricks, or whatever substance has been used) is laid in the bottom, the wet earth, that has been recently thrown out of the trench, which has been trampled upon the stones in a complete state of mortar, by which the interstices have been so closed, as ever after to prevent all percolation. What has been the consequence? Why, the drainer did not understand his business; he did not, in setting out his drains, 'hit upon the springs. But had the trenches lain open till the earth had been dry, before it was returned, the water would have percolated freely, and the desired effect would have been obtained. Upon this principle, I shall propose what I presume an entire new mode of surface-draining, which I think will be more simple and effectual than any yet known.

In the first place, for land in pasture, on all retentive soils, a trench or trenches should be made by a plough six inches wide and six inches deep. The turf cut out square and clean, which may be done by fixing a blade of iron, with the edge sharp, and steeled in an inclined position on the fin of the share; the blade must not be longer than the depth of the trench, which must be filled with gravel level with the surface. These trenches may be nearer or further apart, in proportion to the wetness of the soil; the grass will soon grow over the gravel, and the drains will remain permanent as long as the land continues in pasture. The gravel should be screened, and laid in as soon as possible after the trenches are made. It may be found in the vicinity of most vallies, by tapping the earth with an auger six feet long in the stem. The quantity necessary to drain an acre, the drains eight feet six inches apart, will be forty-eight square yards; at five yards and a half apart, twenty-four square yards or loads. The gravel will not be affected by the feet of cattle; it will receive and discharge the water freely, and entirely supersede the repetition of open drains; and covered ones for surface water, are of but little use. How inconsistent must it be to make a trench upon land that is impervious to water, and immediately fill it up again with the same substance. If the water could percolate in the soil, to the depth of the drain, draining of it would be of no use; for all wet and retentive lands the top of the drains should be level with the surface, and not laid down in the subsoil which is dry, under all lands of this description: that is, the trenches should be filled with a substance through which the water might drain freely from the surface of the soil.

The expence of draining one acre of pasture land by this mode would be very trifling, if the gravel was near at hand. The drains in most soils need only be at the distance of five and a half yards from each other, which may be made with a plough and six horses in one hour; the gravel, twenty-four yards, would be fetched, if at a reasonable distance, and laid in the trenches in the remainder of the day, with the assistance of five men; that is, five men and six horses would drain effectually one acre of pasture per day. For arable land the expence would be nearly double, as the drains should be made nine inches deep and six inches wide, and filled with gravel to the top: it will greatly facilitate the operation if the land is in clover lay. It is immaterial which way it is ploughed afterwards, as the plough can never choke or injure the drain: the gravel would be mixed with the adjoining soil by the continued routine of tillage, but never so as to fill up the interstices and prevent the free percolation of water to that stratum of gravel below the plough. The deposition of a line of screened gravel, six inches wide and nine inches deep in the strongest clay, will for ever destroy its tenacity. However it may be tilled, as tillage will rather tend to increase and enlarge the interstices, than to close and destroy them, it gives the soil a new mechanical arrangement, that will last to the end of time; an arrangement, that will always be a filter to water, and which will be to a retentive soil the best of drains, as it never can be choked.

I flatter myself that all lands, that retain water to the injury of vegetation, would, by this mode of draining, be improved to double their original value.

This mode nature has pointed out to us by the percolation of water upon the earth, the surface of which is so various and promiscuously formed, as to call forth and employ all the active powers of man to cultivate and arrange it, holding out to him the best of all rewards for his labour—Health, and its concomitant, Plenty.

It may be necessary to repeat, that where gravel is laid, it will remain without being moved far from the place by the routine of tillage, which rarely moves the particles of the soil more than eighteen inches from where they have lain for centuries: and as a certain portion of silicious matter, incorporated with clay, will for ever destroy its tenacity, and render it pervious to water; thus forming a soil of all others the most fertile and productive, that only retains a certain portion of water, sufficient for the support of corn and grass in dry seasons. Clays are always the most productive in dry seasons, and the least so in wet ones, owing to the deficiency of percolation, which would be, in a great measure, obviated by this mode of gravel draining. To have the best effect, the drains should be made in an oblique direction with the inclined plane of the land, with the ends of the trenches jutting out into a ditch, whose direction should be the true inclination of the land, by which position it would be always kept open by the discharge of water in the winter months.

I shall here take the liberty of making an observation or two on the effect that water has upon the different soils in a state of cultivation, and on their mechanical arrangement, from the expulsion of air by the induction of water.

Clay is rendered pervious to water by cultivation, and having its contact broken by the different modes of tillage whence the air is incorporated, forming interstices through which the water percolates till the air is expelled, it then becomes saturated, and will admit no more; the water then is discharged from the surface by the inclination of the land, and then is the time that it becomes injurious to vegetation. If water is permitted to remain too long by the flatness of the surface, or for the want of drains, clay well pulverized in dry weather, and its particles at rest, will percolate a considerable quantity before it becomes saturated; but if the particles be put in motion, in the presence of that fluid, the air is immediately expelled by the induction of water, and in proportion to that motion it then becomes impervious; which shews the impropriety of moving clay soils in wet weather, and the great importance in the farmer's being provided with implements that will make dispatch when the weather is dry. *Vide the* CULTIVATOR.---It is on this principle that the banks of aqueducts for canals, &c. are made, by puddling or incorporating the earth with water till the air is expelled, by which means it becomes impervious till the interstices are again formed and re-occupied by air, by the effects of evaporation. This is so obvious, that man cannot walk or ride out upon the high road in wet weather but its effects are every moment presented to his view, where, by the friction of the wheels of carriages, and the feet of animals, even the siliceous substance of which roads are made, is so comminuted and incorporated with the fluid element, that puddles are formed impervious to every escape of water but by overflowing or evaporating. From this simple though too common effect to be noticed, may be drawn some interesting information applicable to some valuable purposes in agriculture. As I have before observed, the water is confined in canals by this principle, so may it be applied and retained in tanks and reservoirs, upon calcareous and gravelly soils, by grinding earth of any description with water till it becomes a pulp or mud, and laying it a few inches thick at the bottom and sides. The only difficulty to be encountered in this operation is to exclude the atmospheric air till the water accumulates. To prevent evaporation from taking place, which, in my opinion, may be accomplished by covering the mud with sand, that would not only exclude the air, but prevent the heavy rains from washing the mud from the sides before the pond is full. It would much facilitate this work if done at the beginning of the winter months, when the evaporation is the least powerful. As a proof of the fact of mud becoming impervious to water where the air is excluded, even equally with a metallic substance, let us examine it at the bottom of old ponds or rivers, where we shall find that no percolation has taken place, that the earth is as dry and free from water, under the mud, as in any other place where the stratum is similar.

In making a reservoir for collecting and preserving water for cattle, it would be necessary to fence it round with rails, and conduct the water from it to a trough, which should likewise be fenced in all but on one side, before which the earth should be lowered two feet, and paved with stone; behind the trough should be fixed a rail to prevent the cattle from being forced into the reservoir. This mode of making provision for a supply of water upon a farm, would, in my opinion, be attended with the best of consequences.

A siliceous or sandy soil is the most pervious of any, and through which the superabundant water percolates the most freely; it is never either saturated or overflowed. In wet weather, and when mixed with a certain portion of clay, it is the most profitable for cultivation, by reason of its not being affected by the extremes of seasons: it has no tenacity, and, consequently, does not contract in dry weather to let in the draught, but retains a portion of water adequate to the purposes of vegetation.

Calcareous soils, where the strata project according to the miners' term "To-day," are always the most productive in wet seasons, the most barren in dry ones, and are the most unprofitable of all others to cultivate, owing to the great expence necessary to supply them with a substance that will retain the water necessary to vegetation.

Peat, if it may be called a soil, is the most difficult to drain (owing to its spongy nature), but very profitable when drained, on the account of its then becoming an inexhaustible mine of manure. From the prolific nature of peat, open drains very soon grow up; to prevent which, gravel-draining to the surface would last for ever. As a small trench cut through a peat moss is apt to close up in a few days, and very often in a few hours, the gravel should be laid in the trench immediately after it is cut. Six inches wide, to the depth of three or four feet, will be found adequate to drain most of the peat mosses in this country. A tool may be constructed that would facilitate the cutting of these trenches, which I should call a Turf Spade; it should be made in the same way as the common spade, but longer and narrower on the bit, and also much longer and stronger in the tree or handle. The bit should be eighteen inches long and six inches wide, with a small blade of steel six inches long and two inches wide, fixed, with a sharp edge downwards, on each side of the bottom of the bit, by which means each side of the spit or trench will be cut at one thrust; and if two similar pieces were fixed on each side at the top of the bit, it would assist the spade in delivering the peat from the trench. The tree or handle should have a sliding socket and stem, on which the workman may set his foot to force the spade into the turf. This socket should be fastened to the tree (when set in its proper place, according to the depth of the trench) with a thumb-screw. By this improved spade, a trench may be made four feet deep by the man standing upon the surface.

As I have before observed, the proprietors of lands would do well to advance the capital, and superintend, by their agents, the draining of all such lands upon their estates, as superabound with water injurious to vegetation, and charge the interest to their rent-rolls. They would, by that laudable means, not only increase the best and most substantial of all capitals, but they would enrich their country with the best of all riches—that is, a labour or value that would for ever attach to the soil; a value that is subject to no risk; that is the most permanent of all others; for whoever might be the proprietors, the country would be the gainers, not only in the increase of its useful product, but in the purity of its atmosphere, and the concomitant health of its inhabitants.

The individual advantage would be great and certain. It would be great as being similar to a new creation; for if the land-owner can by an effort of his reason double the value of his estate, without any foreign aid, it is the same thing as doubling its surface in superficies: and no property can be more certain; for the improvement once effectually done, will last for ever. The only objection that can be made to this laudable expenditure, is the attaching too much to the freehold, by which the provision for the younger branches of the family might be contracted; but this might be done away, if the advanced rent-roll could be assigned for that purpose. The superabundant water discovers itself upon every soil to the meanest capacity, by the species and quality of the vegetables it produces: it does not require the pretended supernatural abilities of the land doctor to point out, with a bird's eye view, the identical spot where the spring exists, or that by tapping it with his borer he could denude a whole country of its water, which does, in some instances, accumulate to form a visible stream; but very rarely is the surface of the earth so constructed or arranged that its waters should percolate to one centre. I believe that in three parts out of four of the cases, where draining has failed of the desired effect, the failure has arisen totally from the drains being made deep (with a view to cut off the water that falls from the adjoining uplands), and filled up with the earth that came out of them while it was wet, which would close its interstices, and render it more compact than in its original state, from which reason the water could not discharge itself by percolation into the cavity inclosed for that purpose. Whereas had the trench been filled with gravel to the surface, it would have had the desired effect. I am confident, that in every situation where the water rises to the surface on lowlands, from the immediate descent of the adjoining uplands, that by making a deep trench, and filling it with screened gravel to the surface, it would cut off and discharge the water from the lowlands without any further trouble. The trench should always be cut parallel with the line where the effect of the water becomes visible on the vegetation, by which means its ascent to the surface would be immediately checked.

The vegetables that are the most conspicuous in universally denoting the place where water abounds, are rushes and sedge (both worthless as food for animals), producing by their matted roots hassocs that spread themselves over the surface, occupying the place of more useful grasses. Sedge is a predominant vegetable in most of our woods, nurtured by the stagnant water which their shade prevents from evaporating; but more particularly upon retentive soils, where, from the want of surface drains, it is often more predominant than the wood.

If gentlemen (who are proprietors of woods, and who are very often tempted to cross them in various directions in their sporting pursuits) would observe the different degrees of luxuriance of wood of the same age, they would ever find that the largest was that which grew upon the banks by the sides of ditches, and upon all elevated situations from which the water is freely discharged; and that in flats, from whence it could not so freely escape, the wood was short and weak. This would point out to them the importance of draining woodlands, by which means their produce would be doubled in quantity, and much improved in quality, besides their being ready to cut much earlier. The rapid and general improvements in agriculture have caused a great demand for underwood, by which the price has been so much advanced as to make a well-managed wood the most profitable acres upon a farm.

Rushes are the most useless and unprofitable vegetable this country produces, and always indicate a superabundance of water wherever they are found; they stand as conspicuous lumber, inviting the hand of the vigilant farmer to strike their hardy stems, on which the storm can make no impression, by withdrawing from their roots their fluid nurture, and for which gravel appears to be his best assistant; to find which, he will do well to provide himself with a land-auger, about six or seven feet long on the stem, which he may procure for less than twenty shillings, which, with a stool to stand upon about three feet high, to assist him in forcing the auger the first three feet into the earth, he may examine all the ditches and vallies upon his farm; where, if he is not successful, it will in most cases pay him to fetch it from a distance, where six horses can draw twenty-five yards in seven or eight hours, within which space I think there are but few situations in this country but what would produce gravel enough for all the purposes necessary, except on calcareous subsoils, which rarely ever want draining, for in most of those situations they part with the water too freely.

Before I leave this subject, I shall take the liberty of making a few observations on the effects produced upon the roads in this country by PERCOLATION and EVAPORATION, which are the two only causes that make and keep roads in repair. It is the presence of stagnant water that destroys them and makes them bad; and, *vice versa*, its absence makes them, and keeps them, good; therefore, whatever tends the most simply to facilitate these two modes of discharging water, may not be unworthy of some attention.

That water with sand, and a sufficient portion of friction, will disengage the particles of the hardest substance, is verified by the works of the lapidary; and as the wear of roads is by friction, the sooner we discharge the water from them the better they will be, and the longer they will stand without repair. Why are they better in summer than in winter? Only because the evaporation is greater from the increased power of the sun, which is much more effectual, in the repair of roads, than percolation. But as that is highly necessary in making them last long, I shall, in the first place, observe, that all substances that retain water should be excluded from them as much as possible, by making of drains, and skreening the loam from the gravel, if that is the material used. One of the greatest improvements that has been made in roads in this country, is in the neighbourhood of Dunstable, on the Manchester road, and does great credit to the commission; that is, by taking up the gravel to the foundation, and skreening from it all the loam and small particles, and returning it back in a pure state, forming therewith a new and excellent road from the old uninjured materials that had been buried for years out of the reach of friction, by the accumulation of mud formed by the reduced particles, and covered over with new materials. Widely different has been the practice in repairing the road betwixt Tyburn Turnpike and the Canal, where the mud that was scraped from it in the winter has been returned and covered with gravel. How inconsistent to return that which should always be excluded—a substance that retains water much more than common earth. If the surveyors of roads would take nature for their guide, they would not commit so many palpable blunders, and the community would enjoy the good effects of their practice. To convince them of the propriety of excluding mud, loam, and small particles from their roads, I will refer them to all wash-ways; that is, roads that are washed by the overflowing of flood-water several times in the year, by which the gravel is completely washed, and needs no other repair upon the most frequented roads. This is an effect of nature, and may teach the surveyors a lesson. Water running upon roads always makes them better; it is when it stagnates that it injures them; consequently, all substances that retain it in that state should, in every instance, be carefully excluded: it is the running stream, where it can be procured, that renders the concave form preferable to the convex.

The good effect of evaporation upon roads is so obvious to the meanest capacity, that wherever the rays of the sun are not excluded, the most illiterate traveller knows from what source he receives the enjoyment of clean travelling; and even the very animals employed in draught and burden, feel the good effects of the evaporating powers of this great vivifier of Nature. But how devoid of feeling is man to deprive his fellow-creatures (as well as his domestic animals) of this enjoyment, by suffering the hedges and trees, by the sides of roads, to grow to that luxuriance of foliage, as totally to exclude the rays of this universal beneficent mender of ways; wherever he can exert his powers, his works reproach man for his sordid negligence. If any surveyor of the highways should doubt the effects of evaporation, let him take a tea-saucer full of water, and place it in a situation where the sun's rays can play upon it the whole of the day, and at the same time place another in the shade, he will then clearly see the cause of a dirty lane; and that by suffering the rays of the sun to be excluded, he is neglecting his duty, and is in consequence unworthy of the situation in which he is placed. If country magistrates would remind the surveyors of this important particular, wherever they see it neglected, I am confident the roads of this country would soon be in a respectable state. I have often admired the mechanical effect produced upon roads by dry weather, and have as often contemplated the elastic and tremendous motion produced by the ponderous wheel rolling upon the earth, when I have seen it yield to the pressure and return to its former state. This effect is produced by the elasticity of the air occupying the interstices of the earth, after the water is drawn out of them by the evaporating powers of the sun. While water is present, there is no reaction to pressure; to whatever state it is compressed, it there remains, and facilitates the division of the particles of the earth, at the same time rendering them adhesive, by which quality they cling to the wheel dragged slowly through the mire. It is to this common existence of air or water in the interstices of the earth, which we are indebted for good or bad roads in their natural state; we should therefore do all we can to facilitate the expulsion of one, and the introduction of the other. Air we can expel from the earth by art, in those situations where we can irrigate, in which process, when the water is first turned upon a piece of land, the air may be seen to escape in an innumerable quantity of bubbles; but the expulsion of water, the most desirable for this purpose, we can only effect by secondary means, that is, by drainage and letting in the rays of the sun. If Agricultural Societies would grant honorary premiums to those surveyors of highways, who keep the greatest length of hedges, by the sides of their roads, under five feet high, it probably might stimulate them to beautify and enrich their country by this necessary attendance. But the best and most desirable of all modes would be to instil a taste into the occupiers of the land, to keep their fences by the highways clipped or shorn, in the same manner as garden hedges. An improvement in the garden-sheers might probably facilitate this desirable purpose, and in consequence unite the beautiful with utility. What an addition would this make to the beauties of the landscape, and at the same time lay open to the eye of the traveller all the recent improvements in agriculture, which are now so laudably carrying on in every county. The farmer would shew his efforts to the best advantage, in exposing his crops and tillage to the view of the public; the approbation of which would be a gratification, united with his own private interest, that would highly compensate him for such laudable exertion. This would be an indescribable pleasure to the improving farmer, and would operate more forcibly on the practical mind than all the books wrote upon agriculture. The pleasure and instruction received in travelling through a well-cultivated country, the hedges of which are clipped by the highway side (as is the case in some parts of England), is such that should induce the land proprietor to grant some favours to the tenant whose industrious exertions produce such comfort. It is to this noble class in society to whom we look up for that patronage which, by its liberal emanation, beautifies and blesses all around: like a ray of the great luminary in a winter's day, it stimulates to exertion those on whom it falls, shedding its benignant influence over the meritorious, remunerating them for their care and attention. It is the landowner that can give this taste to the country around his dwelling; and if he is a lover of good roads and clean travelling, he will give up, for the good of the community, all those little precarious advantages that may be derived from the produce of hedges that grow by the road-side; he will prevent the exuberance of their foliage by the application of the shears, and thereby give pleasure and ease to the weary traveller. It may be asked, Why the eye delights to dwell on hedges in this state? I can only answer, that it appears to me that the love of smoothness, order, and regularity, is planted in the human heart by the great CREATOR

OF THE UNIVERSE; that it is a ray emanating from the Divine Spirit, that we might more fully enjoy his works, which are all smooth and regular. If we examine carefully the minute parts of nature with the microscope, we find all as smooth as glass, particularly in the vegetable kingdom. If we take the smallest pellicle of the most minute parasitic plant we find it perfectly smooth and pellucid; but if we only view by the same power the edge of the keenest razor, we find it as rough as a file or a saw, which is a proof that works of art, of the finest finish, are so far behind the works of nature, that compared therewith in point of smoothness, order, and regularity, they will bear no comparison. This I conclude is the cause why the eye delights in smoothness.

In many places we see the farmer's cattle poaching up to their bellies in mud, when in most situations a few hours work with the hatchet and bill would cure the evil. When a road becomes dirty in this state, it can only be repaired effectually by letting in the rays of the sun, as the water cannot be discharged by percolation, the earth being puddled by friction with the feet of animals, by which means a horse's foot-step holds water as perfectly as if it were tinned, which, when deep and about half full of it, becomes retrod by the animal setting his foot so as to fill up the whole cavity; his weight is not sufficient to force the water into the earth, as it escapes by squibbing upwards, very often most disagreeably, in the traveller's face, or into his boots; the animal's foot forming, at the same time, a new receptacle for the next shower, which becomes more impervious from the friction it receives in this state: water, therefore, can only be discharged from these roads by evaporation. Before I leave this subject, I shall again take the liberty of impressing the importance of remaking roads, by breaking them up to their foundation, and screening the unperished material from the silt and loam, by which means, if it has been of long duration and much used, a sufficient quantity will be acquired to make a new and substantial road without the assistance of horses or carriage; all that is required is labour of the hand, as the material is on the spot and of the best kind, better than can be obtained from any other place, as it is the hardest and most durable, having withstood the wear and tear and friction of the wheels; whereas the softer and more perishable parts have been reduced to silt and loam, which envelopes those that have not been ground down. In proportion to the increase of the reduced parts, the road wears into holes, which are receptacles for water, and of course assists the friction, which very soon renders it unpassable if not repaired. A road that is renewed by screening will wear much longer than one made of new materials, and the expence is certainly much less. The inconvenience to travellers would be very little more than repairing them in the common way, as one side may be broken up, screened, and relaid to a given distance, leaving the other for passengers, and when a certain space is finished to change about. If any Commissioner or Surveyor doubt the propriety of this mode, and wish to ascertain what quantity of unperished materials their road will produce, let them order a certain number of square yards to be broken up, screened, and examined, by which means they will be enabled to judge to what extent they should proceed. What gravel or stones there is found will be of the pure and hardest kind; if they were rough and angular in their original state, they will be found with their angles worn off and free from fractures, and in the best possible state to make the most durable road. All the soft and fractured stones that were brought from the pit or quarry have been reduced to silt by the pressure of the carriages, which the sound and hardest ones have escaped; and when selected from the mass of earth that envelopes them, are the very best materials that can be procured.

A machine for breaking up roads might be constructed, that would facilitate the business in loosening the gravel, but it would be necessary to peck it over, and break the parts that cling together, to assist the screening.

A screen may be constructed on wheels, and made long enough to reach across the part that is broken up, and moved forward about two yards at a time, drawn over the silt and small particles that come through, which should be laid inclining, and beaten down with a rammer before the gravel runs upon it; by this mode, not more than ten yards long of the half of the road need be occupied at a time, which would not more impede the passengers than one carriage passing another. I am confident, if commissioners would consider this philosophically, they would admit the propriety of raising to light and service those portions of gravel and stone that have lain buried inert for a number of years; and place them in that situation wherein they might answer the intended purpose for which they were originally deposited there: an immense quantity of valuable labour, that has lain dormant for some time, would be brought into immediate use. For those materials that lie below the wear and tear of the road can be of no use, though their deposition in the formation of a new one is unavoidable, owing to the perishableness of their nature, and their aptitude to fly off from pressure on the account of their form.

It may here be observed, that the fractured and reduced particles tend to bind and hold the other firm together, making therewith a sound good road. This I admit, that in that state it is the best. It is not these binding particles I wish to remove; it is when they have received a different form; when they have lost their contact, and become mud or dust, that makes them injurious. When in this state they superabound, they form receptacles for water, which assists the friction and rots the road, the effect of which is shewn by its breaking up into holes. It may always be observed, that when a road is going to ruin; when the materials are once broken through, it is very rapid in decay if not repaired. It is from this breaking up, and the necessary repairs from time to time, that has accumulated such a vast fund of unperished materials on all roads that have been made for some years, and much used. I do not know from what cause, or by whose advice the commissioners before mentioned were induced to search for and bring to light this hidden treasure. They must, however, in this case, have been better advised than when they expended their money in making that circuitous cut through Chalk Hill, where half the labour would have cut it straight with the old road down to the same inclination. All the labour of raising the chalk that now lies on each side the cut, might have been saved, if proper means had been used: the inclination of the plane is sufficient for gravity to have removed it into the valley, without the necessity of one barrow-full being conveyed by any other power.

As the making and repairing of roads is so nearly allied to Agriculture, I shall take the liberty to describe a machine that would have conveyed the chalk into the valley by its own gravity, whereby it would have been raised in proportion as the hill had been lowered.

An inclination of two inches in a yard will be sufficient for most roads, which may be set out and carried on by an improved spirit level with a bevel foot, which opens with a joint similar to a pair of compasses. This improved and simple instrument will be found extremely useful in taking the heights of inclined planes for any purpose*: it may be made six or nine feet long, and is nothing more than a pair of large compasses, with a glass tube, containing the spirit hermetically sealed, and fixed at the bottom of one leg, (see Plate the 9th,) D the tube, E a rule stuck in a mortice hole in the lower leg, which gives, at first sight, the true inclination required. Being provided with this instrument, a few yards should be laid in the desired form, commencing at the centre of the hill, or where the intended inclined line passes that of its original form. Here a vertical capstan should be placed long enough to reach across two cast-iron railways, with room for two waggons to run on them, and pass each other. At each end of the capstan, opposite the centre of the railways, should be fixed a cable or chain, one of which will coil up at the time the other is uncoiling. A small railway waggon must be fixed to the other end of each rope or chain, by which means the loaded one will descend, and by the power given to the capstan by its gravity, it will, at the same time, draw up the empty one, and continue, *vice versa,* till the work is finished. The capstan must be moved, and the railway lengthened, as the work proceeds; by this means the hill will move itself into the valley; the raising of which in proportion as the other is cut down, must greatly facilitate the completion of the work. If any person doubts the practicability and economy of this plan, let him examine that stupendous work at Walkden Moor, near Manchester, which was executed by his Grace the Duke of Bridgewater, to convey his boats loaded with coals from the upper canal to the lower one, down an inclined plane that falls one in four through the heart of a rock one hundred and fifty-one yards, on which is conveyed nine hundred tons in eight hours. This enormous work, which stands unrivalled in the engineering world, makes a communication betwixt two subterraneous canals. The lower one, which is on a level with Manchester, perforates the bowels of the earth for twelve miles, including all its ramifications, to different parts of the mine. Thirty-five yards and a half perpendicular height above the level of this excavation is the upper one, consisting of near six miles, to work the upper mine, which varies from thirty-eight to sixty-one perpendicular yards below the surface of the earth, making in the whole near eighteen miles of tunnelling. The boats carry about twelve tons, and float into a lock upon a carriage or cradle thirty feet long, which moves upon four solid cast-iron rollers down the inclined plane, which is also of cast-iron. The carriage and boat are fastened to a cable which uncoils from one end of a capstan, at the same time another cable is coiling on at the other end, which brings up another carriage with the empty boat, and *vice versa*; the loaded boat is put in motion by one man working with a winch and pinion upon a spur wheel that is fixed upon the capstan.

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* Particularly in laying out water meadows for irrigation.

Of this, as of most of his other great works, the Duke of Bridgewater was the planner and contriver. To project greatly, and execute completely, were the efforts of his great genius. This patriotic father of inland navigation has done more towards improving the roads of this kingdom than any other man, giving before-unknown facilities to commerce, by the conveyance of goods upon an element, on which the pressure of the burden leaves not a track behind. Ages in futurity will reap the benefit of this patriot's exertion. For whatever promotes and facilitates the circulation of a nation's staple produce, must increase the riches of its inhabitants, and render their comforts more permanent. And so long as the rudder continues to plough the still water, will the name of BRIDGEWATER stand foremost amongst the Benefactors of Mankind!

ON MACHINERY APPLICABLE TO AGRICULTURE.

THE benefit to be derived from machinery applied to agriculture is great beyond description, but slow, very slow, in its introduction, from very obvious reasons, the incapacity of its labourers to conduct any thing that requires an extra effort of the mind. The very word 'Machine' carries to their ideas such an abstrusity, as to confound and discourage any attempt to analyse the most simple tool that is called by that name. This confusion arises, I presume, from the two following causes: first, from the mind not being enlarged by education, and the difficulty it has to expand itself to any thing beyond what custom has taught it.

Secondly, From the apathy with which unlettered men, at a certain time of life, adopt new modes or form new ideas; they having laid in a stock of knowledge, acquired by custom, sufficient, they presume, for all the purposes required in their station : they, therefore, do not like to give up what has cost them nearly half an age to acquire, in exchange for new modes with which they are totally unacquainted, and which will set them back in life, even on a par with the youth that is just entering on business, without his incitements to persevere. To attempt to rob them of their ideas, or render nugatory what custom has taught them, would be a task not easily accomplished : therefore we must endeavour to teach the youth such habits and customs, that the improved state of agriculture, and the imperious necessity of the times require. I would, therefore, advise never to set old men to superintend new machines. Young men are much sooner taught new modes, from a very obvious cause, their ideas are not so indelibly fixed by the hacknied routine of custom ; in consequence of which they are far more susceptible of receiving an impression. It is not to be supposed that the unlettered peasant can be made a mechanist; but he may be taught to conduct all the machinery necessary in agriculture ; to accomplish which, requires the fostering care and instruction of the master, from plain and simple rules given by the mechanist ; at the same time holding out to him some private emolument by way of incitement to fix his attention, as many apparent difficulties vanish before perseverance, stimulated by self-interest. From this motive, the farmer will, with a few hours attention, assisted by a plain direction, fully understand all the component parts of a machine, which it is highly necessary that he should know, and for the want of which, very often, a machine of the most simple kind is rendered useless by the defect or disarrangement of one of its component parts, when, in all other respects, it may be perfect ; and with this arrangement may continue to reproduce the desired effect, if he would divest himself of a prevalent idea, namely, that when it is out of order in the country they have nobody that understands it, that can repair it, and set it to work again. By making himself acquainted with its component parts, he would at all times be able to judge what were the extent of its defects, and point out a mode by which they might be obviated or arranged. He would do well at all times to take this problem into consideration, THAT IF A MACHINE HAS ONCE PRODUCED A DESIRED EFFECT, IT WILL CONTINUE TO REPRODUCE THE SAME, SO LONG AS ITS COMPONENT PARTS RESPECTIVELY PERFORM THE MOTIONS ASSIGNED TO THEM; BUT IF ONE OF THOSE PARTS, EITHER BY FRICTION OR THE BAD QUALITY OF THE SUBSTANCE OF WHICH IT IS MADE, SHOULD BREAK, OR BY ANY OTHER MEANS GET DISPLACED SO AS NOT TO PERFORM ITS PART, THEN THE MACHINE WILL CEASE TO PRODUCE THE SAME EFFECT TILL SUCH PART IS REPLACED.

If this problem was strongly impressed on the minds of the British farmers, it would do more to facilitate the introduction of machinery applicable to agriculture, and render it more generally useful than any other means. By this mode the word 'machine' would lose its mystical charm; it would give the idea of what it really is—a combination of wheels, levers, &c. arranged to produce a certain and particular effect, and which it will continue to reproduce, so long as that arrangement remains complete, and the instructions of the mechanist are adhered to.

The obstructions that impede the introduction of machinery applicable to agriculture are many; but there is not one of them so formidable as to withstand the exertions of the reflecting farmer, who brings into action all his good sense and reason, the fruits of his reflection, to combat their hydra form—BEFORE REFLECTION AND APPLICATION THEY WILL VANISH. By his exertion and perseverance he will conquer those absurd ideas that have originated in an uninformed mind, and which prejudice the unthinking against the introduction of NEW CAUSES TO PRODUCE DESIRABLE EFFECTS. They have, unfortunately, too many objects before them to strengthen that prejudice, in the number of machines that are standing useless, as emblems of the incapacity of the mechanist who invented or made them; the consequence of men attempting to make machines, without having previously acquired a clear and perfect knowledge of mechanics, by which they would have been enabled to construct upon sound principles. The importance of the abridgment of labour by machinery being so obvious, has caused an unprecedented demand for machines, even for those that produce but a partial effect. This has brought forward a number of makers without any pretention to mechanical knowledge, which have inundated the country with a number of machines, on bad principles, ill-contrived, and badly constructed. Those that have been able to stand their work for any length of time, produce, with great labour, inadequate effects. These unsuccessful and fallacious attempts have greatly checked the progress of introduction; for the quackery of mechanics is widely different from the quackery of physic; the objects of the former remain upon earth as monuments to deter the people in their neighbourhood from running into an error, by purchasing a thing that will not produce the effect proposed; whereas the latter do not proclaim the injuries they receive from the prescriptions of the pretender, by reason of their being buried in oblivion, as "dead men tell no tales." The human body is a machine, the secret motions and capabilities of which we can but imperfectly describe, so are the varied and unknown effects that may be produced by the different arrangements of the mechanical powers. It is under this rock of OBSTRUSITY that the quacks of both professions take shelter; by this they are screened from the derision of the unthinking crowd.

The capabilities of mechanism are so widely varied and extensive, and at the same time, so abstruse in the effects to which they are applicable, that it requires all the exertion and perseverance of the most active and fertile imagination fully acquainted with the mechanical powers, so to arrange and combine them, to produce NEW AND BENEFICIAL EFFECTS. Therefore what can be expected from the exertions of a mind that is totally unacquainted with the effects of gravity, and the powers of the lever in all its varied forms? If it discover a new effect, it must be ascribed to one of those fortuitous events, called accident: it may imitate, but it is very rare that a mind, so contracted, can create; its crude attempts, pushed upon the world, very often impede, for a time, the introduction of those genuine productions that fully produce the effects proposed. When an experiment is tried in a neighbourhood, and proves unsuccessful, it is some time before confidence is restored sufficient to induce a new trial. In many instances a machine may produce a partial effect, so imposing at first sight, as to hold out an apparent advantage in its adoption; and, in some cases, that advantage is placed in too glowing colours by the purchasers, in saying they would not part with it for double its cost, if so situated they could not procure another. This is a very common and natural observation, for no man likes to have his judgment impeached in his selection of things, whether for ornament or use. It would, therefore, tend to encourage improvement, if each individual would examine for himself, and form his judgment by the effect. I always make it a rule, when I go to see a machine at work, to examine minutely the effect, before I look at the cause: when the first is fully produced, it then becomes more interesting to gain a full and clear explanation of the latter.

The importance of employing machinery in agriculture for the abridgment of labour, particularly in the manufacture of corn, is so obvious as to need but little comment; by such means a superabundant labour will be moved from the barn to the field. To assist in the support of an improved cultivation (which to a country like this, whose situation and habits draws such numbers of its inhabitants to other employ) must be of indescribable importance to the State.

Machinery, as applicable to agriculture, therefore, holds out some remuneration to the man who is so fortunate as to invent an arrangement of its powers, that will produce a new and advantageous effect: this will be some consolation for him on his way through the precarious labyrinth of invention; the slow and progressive motion of which requires some cheering hope to stimulate the mind to exertion; to extricate itself from the maze that ever awaits the adventurer in this intricate and bewildering art, which often involves him in embarrassments, from which it requires great efforts to escape. For it very rarely happens that the three principal qualities, necessary to make a mechanist, are united in one and the same person; that is, first a thorough knowledge of the mechanical powers, and the purposes to which they are already applied, by which he may be guided in making new arrangements to produce advantageous effects; second, a cool, sober, persevering creative mind, fertile in original ideas; a mind that can bare with equanimity the failure of experiment in search of the effect desired, and a perseverance that brings into action new modes from a creative fancy, formed on a conviction of the probability of success; and thirdly, a full supply of the circulating medium, by which all the Arts are put in motion, and which is so highly necessary in experimental pursuits. The theory of the art may be acquired by an active industrious mind at a small expence; but the practice necessary to perfect a machine requires much patience, and very often a considerable sum of money must be expended before the desired effect can be obtained, sometimes too much for the risk of an individual.

Query.—Would it not have been a laudable thing, highly conducive to the interests of agriculture, had the Board set apart a sum of money, annually, for the sole purpose of making experiments on implements and machinery, by which means many new modes might have been discovered, and others that are already known have been much improved. It is somewhat singular that, amongst all the Agricultural Societies in Britain, a fund has not yet even been proposed for this important purpose, although many of the Members have been for years expending large sums in purchasing the hasty and ineffective productions of needy individuals, a small moiety of which expenditure would have supported a fund for the purpose of making experiments, from which the highest possible advantage might have been derived. We have seminaries for teaching the acquirement of most of the luxurious professions in life, but not any to teach as a science, the most necessary of all others, the manufacture of bread-corn ; what has hitherto been done to elucidate and facilitate this important art, has been at the risk and expence of individuals. When this is duly considered, we cannot be surprized at the slow and tedious progress of improvement. We daily see the rapidity with which those arts are perfected, that are patronized and supported by public bodies. The cause itself is evident from the confined circumstances of individuals, which often check the aspiring genius, and blast the most sanguine hopes of bringing to maturity those ideas that might have been of the greatest use in perfecting the first of all arts, had they been nurtured by the fostering support of a public fund.

The patriotic members of the provincial societies are very numerous, and of the first respectability; men of candour, associating for general information, who would contribute liberally in support of a fund, by which they could obtain the object of their inquiry, had such fund ever been proposed and properly made public. There are societies that very laudably grant premiums to the person that produces any new implement or machine useful in agriculture; but there are so many fallacious attempts, before any thing useful can be produced, that the projector has but poor encouragement in becoming a candidate for this precarious fame : it is nothing but a cool, active, sober, persevering mind, that can overcome the disappointment and disgrace which the world liberally bestows (for the best of reasons) on an unsuccessful scheme. How easy it is for man to form an idea of effects that would be desirable, without thinking about the cause that should produce them, satisfying himself with this observation, " It would be a good thing if it could be accomplished ?" This apathy, with the difficulty with which the human mind analizes the causes that produce the most useful and important effects, tends greatly to impede the introduction of machinery. As an instance of which, I shall here relate a circumstance that occurred in my own practice :—I sent a thrashing machine to a gentleman who had a horse-power already erected, therefore the machine was only to be taken out of the waggon, and set on the barn-floor and put to work, by putting the band upon it to communicate with the power; in consequence of which, I did not send a man to erect it, it was put together in the waggon ready to go to work; the frictors and rollers not being confined, but merely resting by their own gravity on the regulating chains, they were taken off to lighten the machine in moving it out of the waggon ; in returning them to their places, the rollers which were driven by two pinions, fixed on their axis at one end of each of them, and which work into each other, were laid, the upper roller with the end, on which there was no pinion, on the pinion of the lower roller; in which position the machine worked for three weeks, till the teeth of the pinions were worn nearly away. Such instances as these are the greatest difficulties the mechanist has to encounter, in introducing machinery for the purposes of agriculture, and which must, of course, enhance the price, to make him some compensation for the risk.

I shall here take the liberty to make an observation on the price of machines, the improvement of which, as I have before observed, has been made by the exertions and risk of individuals ; it therefore is reasonable that the man (who has by unwearied perseverance produced a machine or implement, that produces a beneficial effect) should divide the advantage with the public, who, in the end, are by far the greatest gainers, as what it obtains is clear profit, no expence having been incurred in the invention ; whereas the man, who has not only spent his time and property in this precarious speculation, but has undergone an anxiety of mind, for which no profits can compensate ; for the public cannot reward him for that deprivation of happiness which he suffers on his way through a labyrinth of uncertainty, in search of that knowledge which can only be obtained by experiment, and doubly happy is that man whose ideas preclude him from entering into that mazy path.

On this account it must be expected, that new and effectual inventions will obtain higher prices than things that have been long in use: in consequence of which, small farmers must be, in some measure, for a time deprived of them, except their landlords would have the goodness to advance the money for their cost, and charge them with an interest; by which means their barn-labour would be abridged, giving them time to carry on an improved cultivation upon their estates. The public would with them be doubly interested by the general introduction of machines; the small farmer could much easier pay a small annuity than the prime cost of expensive articles, which, generally, would draw away too much of his capital, leaving him confined in some other part of his farm, and causing him to condemn the machine for having, in some measure, brought him into distress. In this case, he had better not purchase if his landlord will not assist him, but continue to plod on in the way in which he has been accustomed, "for half a loaf is better than no bread;" although, at the same time, there is no one article in which he can expend his money that will return him greater profit, than implements and machines for the abridgment of labour. This is a species of profit that cannot be defined, in consequence of the incalculable advantages that are hourly arising from the command of labour it gives to the farmer to employ in those important seasons, that are so particularly favourable to all the varied pursuits of agriculture. In fact, it is the acmé of man's employ upon earth—the desideratum of his enquiry—TO OBTAIN THE GREATEST PRODUCE WITH THE LEAST VISIBLE LABOUR. And in no one instance can the land-owner employ his capital, with so much profit to himself or interest to the public, as by supplying his tenant with the means to obtain this desirable end. But should he be disposed to adopt this laudable plan, it will be highly necessary that he should pay the greatest attention in making his selection of the kind of machines he purchases, or he may fix his tenant with an advanced rent, for an article that will not produce the intended effect. In making this selection, he should in all cases, where it is possible, see the machine perform its work before he orders it. The best and most durable is that which produces the desired effect with the least power: the mechanist is too apt to run into the extreme, by paying more attention to the quantity of work done, than to doing it effectually. This extreme has checked the progress of machinery more than any thing I know: the farmer has had his expectations worked up to the highest pitch, by the luring idea of the vast quantity of work that could be accomplished by such a machine; but, unfortunately, when he has got it to work he has found, from the great power it takes, and the consequent wear and tear, besides the ineffectual manner of its performance, that it does not answer his expectations, and that he should have been better satisfied with a machine of less power, without those pretensions to the great quantity done, but to the effectual manner of doing it. These have been the common observations of those farmers that have been disappointed in their selection of machines.

These disappointments might, in some measure, be prevented, if the Board of Agriculture would appoint a place for the trial of all the different machines brought forward for the abridgment of labour, and publish periodically the effects they have produced. This would assist the mechanist, by making his productions known through the most respectable channel, if found to produce a new and beneficial effect; or condemn them to that state of oblivion, that will in time eventually await them, if they do not produce the effect proposed. This trial and publication of their different effects, would be a guide to the farmer in adopting those articles that would best suit his purpose, and preserve him from an imposition that the difficulty of the case will ever subject him to.

Query.—Would not a plan of this kind, properly conducted, be the most conducive to the public interest, by giving the artist an opportunity of exhibiting his works before a Board that is competent to judge of their merits? But this cannot be done without a farm of considerable extent, which should be devoted solely to this purpose. If this were adopted, it would raise up an unprecedented emulation in this country, by giving genius an opportunity of shewing itself, with the hopes of being more immediately rewarded according to its merit. But, in the present case, the mechanist is not only confined to spend his time and money in a long and expensive course of experiments, before he can produce any thing that is useful to lay before the public, but he is obligated to spend an additional sum to make his invention known, before he has any chance of being reimbursed his expences. This, with the prejudice he has to encounter, will make him repent ever having entered on this doubtful and expensive path, wherein, if he succeeds, it must be by dint of unwearied perseverance; and if he fails, he is slighted with indelible disgrace, and branded by society with the opprobrious epithet of "a Schemer!"

I shall conclude the subject with this observation, That the Board of Agriculture have it in their power to do more towards the general introduction of improved machinery, than any other means yet known in this country, and for which they would be sure to obtain the best thanks of the public.

ROLLS.

THESE simple and useful implements are various, and well constructed for the different purposes for which they are required, such as the Plain, Whole, and Jointed; the Spiked or Hedge-hog; the Norfolk Drill, or Fluted; the Parallel or Cutting Roll; all of which have their particular advantage, and do not need much improvement.

The plain whole Roll is well calculated for all soils that is not laid in ridge. In most of their rollable states, the only improvement it requires is to prevent its twisting up the corn, &c. in turning too short at the land's end, which is not much obviated by the Jointed Roller, where the principal use of which consists in clasping over the acute angles of small ridges, and couching into the furrows; the turning at the land's end is not so much facilitated by the joints as it at first sight appears to be. The best effects in using these implements are to level the soil, and close it to the roots of corn; and upon fallows to break the clods, to disengage it from the roots of grass and weeds. The Spiked or Hedge-hog Roll is a useful implement upon steely foul fallows, where the clods are large and hard, but is very difficult to turn short upon whole ground: a simple improvement to obviate this would be desirable.

The Norfolk Drill or Fluted Roll, is an expensive though useful implement upon a sandy soil, where the dibbling system is not used.

The Parallel or Cutting Roll is a very useful implement for all coarse stiff fallows, where the contact of the furrows arises from the roots of grass. It consists of a piece of oak, ten feet long, cut into an octagon form, with flat bars of iron, half inch thick and four inches wide, fixed into the angle edges parallel with the timber, which clip the furrows into small pieces, and greatly facilitate the harrowing or working of the cultivator, and obviate the necessity of cross-ploughing, which is very tedious and difficult when the land lies in ridges. This implement should have a pair of small wheels fixed upon the frame, upon which the Roll may be turned over, and conveyed from field to field.

This Roll should not be used upon land that is full of couch, where it is intended to be gathered off by the hand; but upon strong fallows, where the couch is destroyed by being exposed to the sun and atmospheric air, it is of the greatest use, and under those circumstances abridges the labour more than any implement I know, by reducing the clods to a size through which the power of the sun can penetrate.

The CRADLE, or BOWED SCYTHE.

This implement for laying the straw parallel in the swathe, at the time it is cut, facilitates the collecting it for banding. As thrashing machines come into use, this Scythe will be of the greatest importance for harvesting the corn in sheaves, by which means it is handed to the machine with so much more facility. This will be the greatest inducement for the farmer to give up that uneconomical custom of harvesting his corn loose, by which so much loss is sustained in the field, not only in the conveyance to the barn, but from the trampling out at the time of carrying, the loss from which is incalculable.

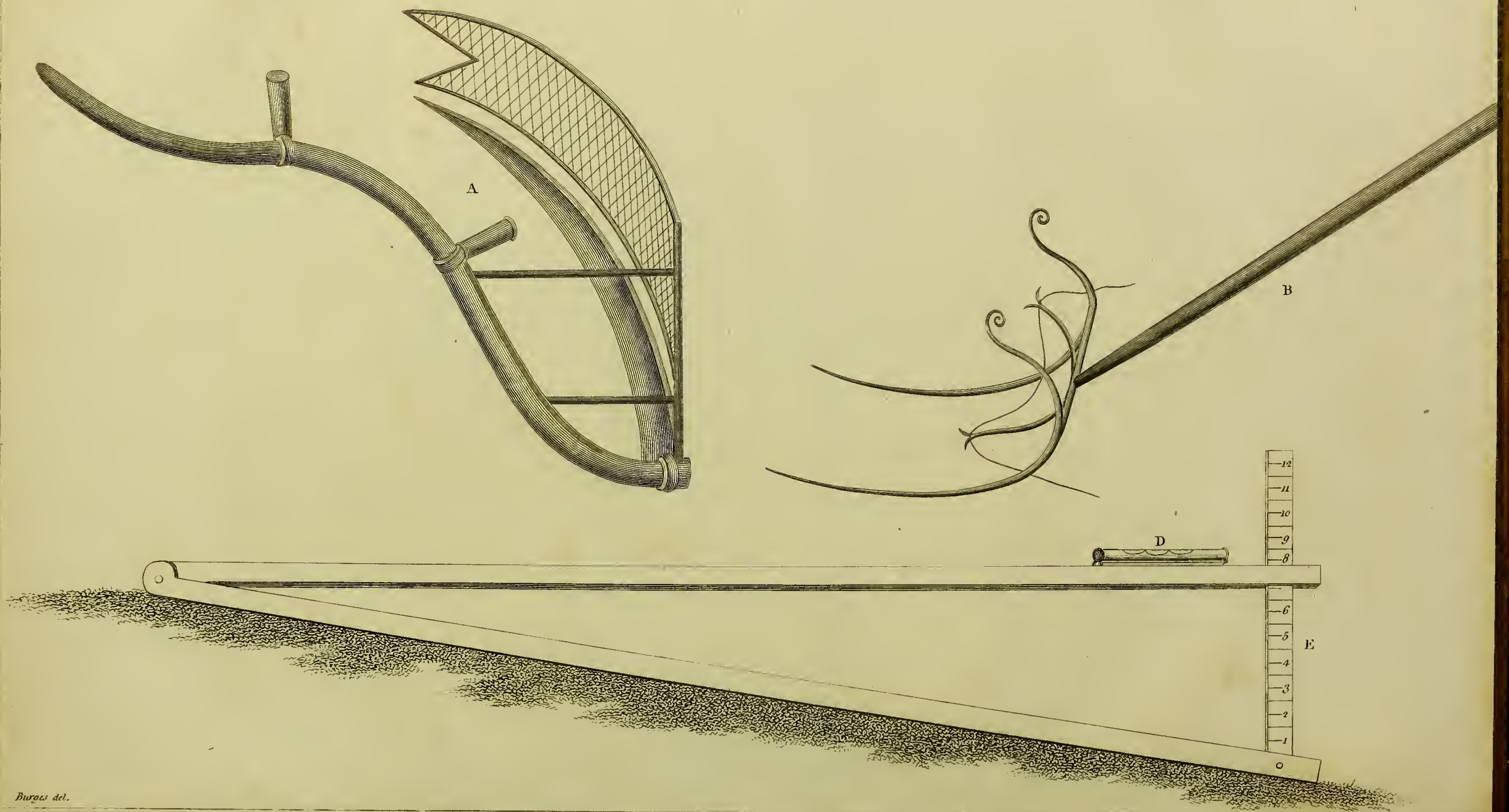
The cradling or bowing of the Scythe varies in different countries; but I think the best of them will admit of some improvement. If the bow were formed of wire, and the interval betwixt it and the blade, clothed with canvass oiled or netting, all but about three inches, to admit the rubber to pass in wetting (as at letter A, plate 3), it would sweep the corn cleaner into the swathe, and prevent the short or underling straws from pitching through the cradle, and would lay them in a parallel direction, so as to facilitate the collection with the banding fork into sheaves.

An improved BANDING FORK.

This implement I have invented for the purpose of facilitating the collecting and binding into sheaves corn from the swathe, by which means that useful and economical labour is greatly abridged, by placing the band in a position in the fork to receive the corn as it collects; which I presume, will preserve a great deal from being shook and trampled out, and tend by its facility to introduce the practice, as one person can bind as much with this fork as two in the common way. Letter B (in plate 6) shews the position of the fork when at work; the band which is supported by two small forks, terminating at their bottom in very acute angles, which prevents the band from drawing out, as it is forced under the swathe, which should always be mown with the cradle scythe. The band may be made of various substances, but hempen ones are the cheapest and best, as they will last for many years with proper care: the strands of old cables and ship ropes may be procured for a trifle that will make many bands. The number necessary for an acre may be calculated in this way; if of wheat, suppose it produces on an average forty dozen sheaves, and all other corn in proportion; the bands may be procured at 2d. per dozen, that will last seven years, which does not amount to one shilling per acre, per year, except compound interest be added. The economy of the barn will teach the farmer how to preserve his bands.—Vide the Separating Machine.

The CORN and HAY PRESERVER.

This, of all the implements in Agriculture, is of the greatest use, and what the smallest farmer should not be without, who has not barn room enough to receive the produce of his farm. This is the most important moment throughout the year, when this implement is required, to secure most effectually the produce of all his annual toil, care, and attention, which is very often destroyed or injured in a few hours, by being carelessly left through the night exposed to the baneful effects of a precarious atmosphere, in consequence of the stack not being finished in one day, and very often when it is finished by rain falling in the night before it is thatched, many thousand quarters of corn are destroyed every year by this exposure. When the water has lodged in the roof of a stack from a heavy shower of rain, it very often takes some days before it is effectually dried, so as to be in a proper order for thatching; and if the weather should not continue clear and dry, the corn grows or becomes saturated, so as to injure it greatly either for malt or meal; this depreciates the quality, which is found when it goes to market, and in



Burges del.

consequence, is some punishment to the farmer, for his negligence and inattention. I am fully convinced, from my own practice, that the credit attached to the producing a sound bright sample of corn at the market, will stimulate every farmer (who has the ambition to excel) to use every means to preserve his corn from the rain, after it is collected. I have myself, excited by this motive, made it a rule never to leave a stack of corn exposed for one night in the finest weather; the expense of covering, after the labour of the day in the field is over, is a mere trifle in comparison with the advantages secured; the men will at any time cheerfully assist in this business for an extra pint of ale per man: by this means, if the stack is finished, it not only preserves the quality of the corn but expedites labour, for if rain falls in the night, and the next day should be wet so as to prevent field-work, thatching may be carried on by turning back the covering as it proceeds. These advantages united, I presume, would stimulate every thinking farmer to adopt the most expeditious, simple, and effectual mode of covering. Wheat straw is mostly made use of for this purpose laid on in loose yelms, and commonly called 'rough thatching;' this takes up some time in laying on, but when properly done, it will keep out two or three days rain.

The Preserver here described is generally used in the vicinity of London by the hay farmers, and costs when new from twenty-five to thirty pounds and upwards, in proportion to the size, exclusive of the two old cart-wheels. This may appear a large sum for a small farmer, but if he can spare the money, he may rest assured it will pay him from ten to fifteen per cent. interest, and to a large farmer from twenty to thirty, and in wet harvests much more. This would be of the greatest importance in those years, after a severe winter, when all the straw has been consumed in support of cattle, and the stacks are obliged to lie exposed to the weather till straw is procured from the barn or stubble from the field. In the meantime very often much damage is sustained, and the care, toil, and labour of twelve months, and sometimes two years, is exposed to the risk of destruction in four or five days. This must be derogatory to common sense, and calls for the utmost economy and attention, at this important moment, to secure effectually the produce of the annual labours of the field.

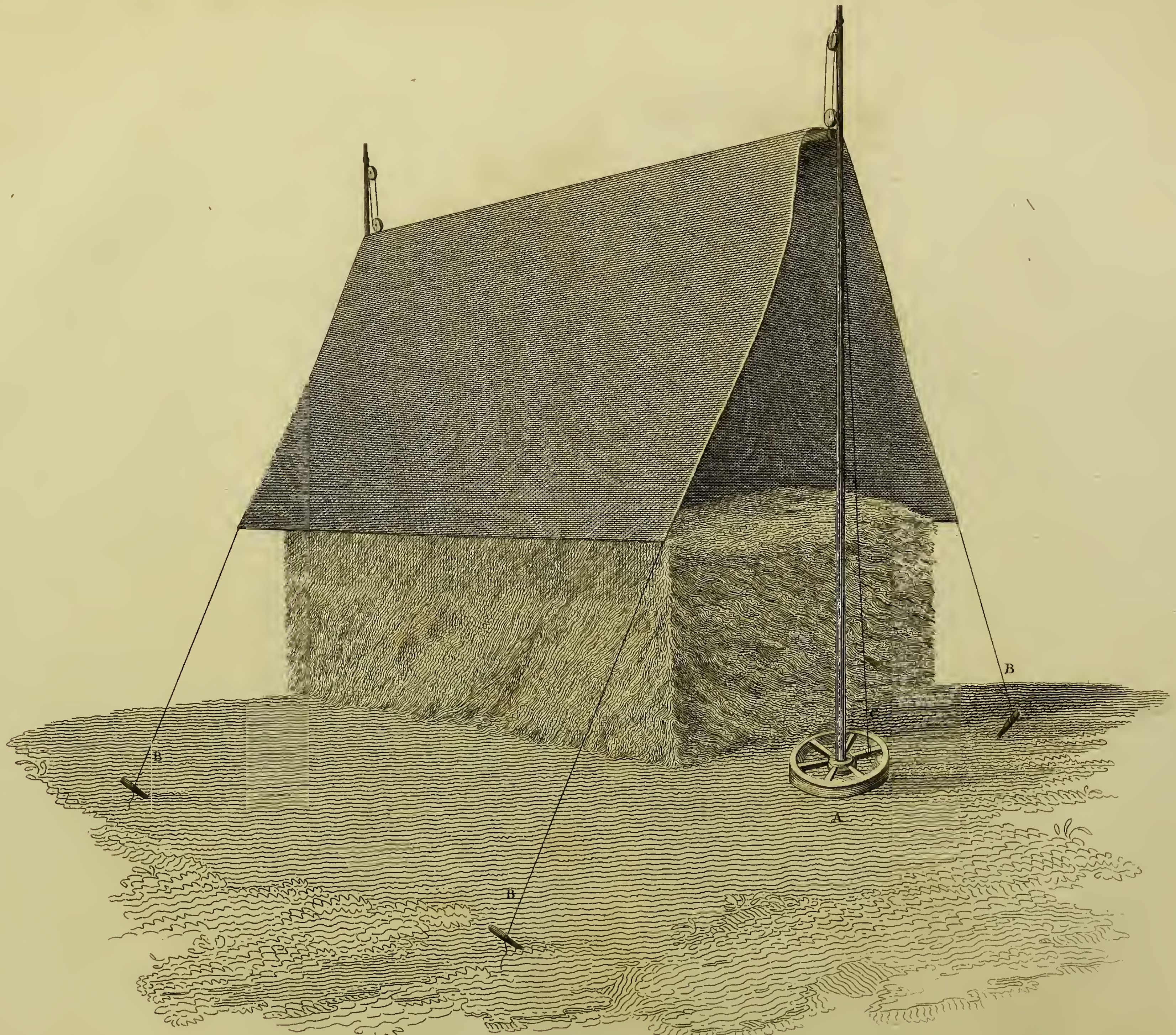
The harvesting of corn in the sheaf, and securing it effectually when collected, would save to the country annually many hundred thousand quarters; for though the loss from habit or custom may appear trifling individually, yet in the aggregate, it is great beyond conception, and with bad threshing requires more attention and consideration than all the other branches of Agriculture put together. The obvious utility of the Preserver here described requires no other comment than a perspective view and explanation of the machine.

Plate 8, Letter A, an old cart wheel, one also is laid down at the other end of the stack, into which is fixed two poles that support a third, over which the cloth is thrown and drawn up to a proper height, and the lines B B B drawn tight. When the stack is to be enlarged, these lines must be disengaged and drawn over the cross-pole, round which the canvass may be rolled while the men are at work. C, a line running through two small pullies, by which the bearing pole is elevated or depressed: the same at the other end, but not seen in this figure.

ROOT WASHER.

SINCE the modern improvements in the breeding and feeding of cattle has so laudably engaged the attention of the farmers and graziers in this country, every effectual attempt to assist and facilitate that desirable purpose may be worthy of some attention.

The practice of feeding animals on roots in winter, as a substitute for green food, has caused some inquiry after the best mode of cleaning



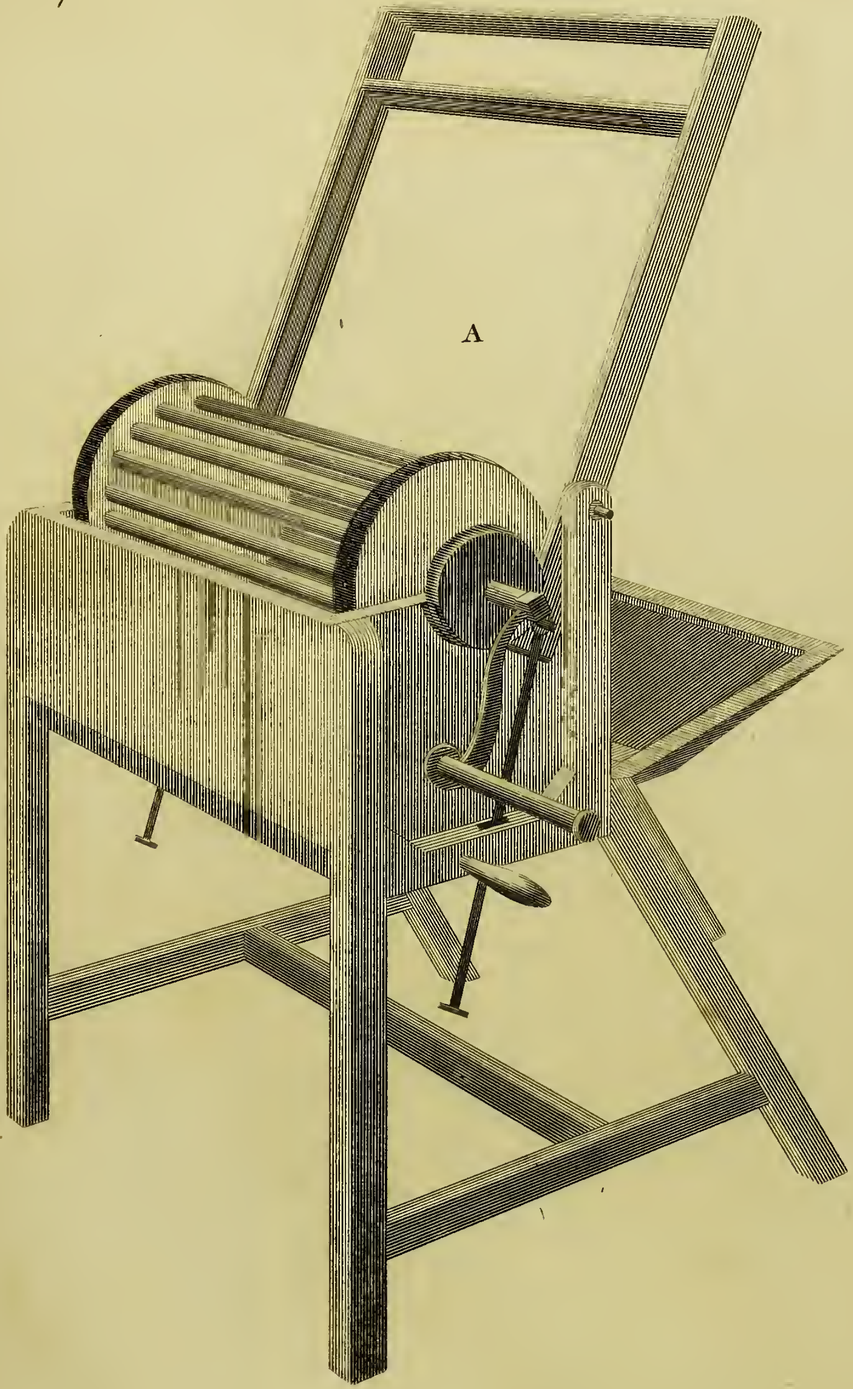
V. Woodthorpe ſc. 19. Fetter Lane.

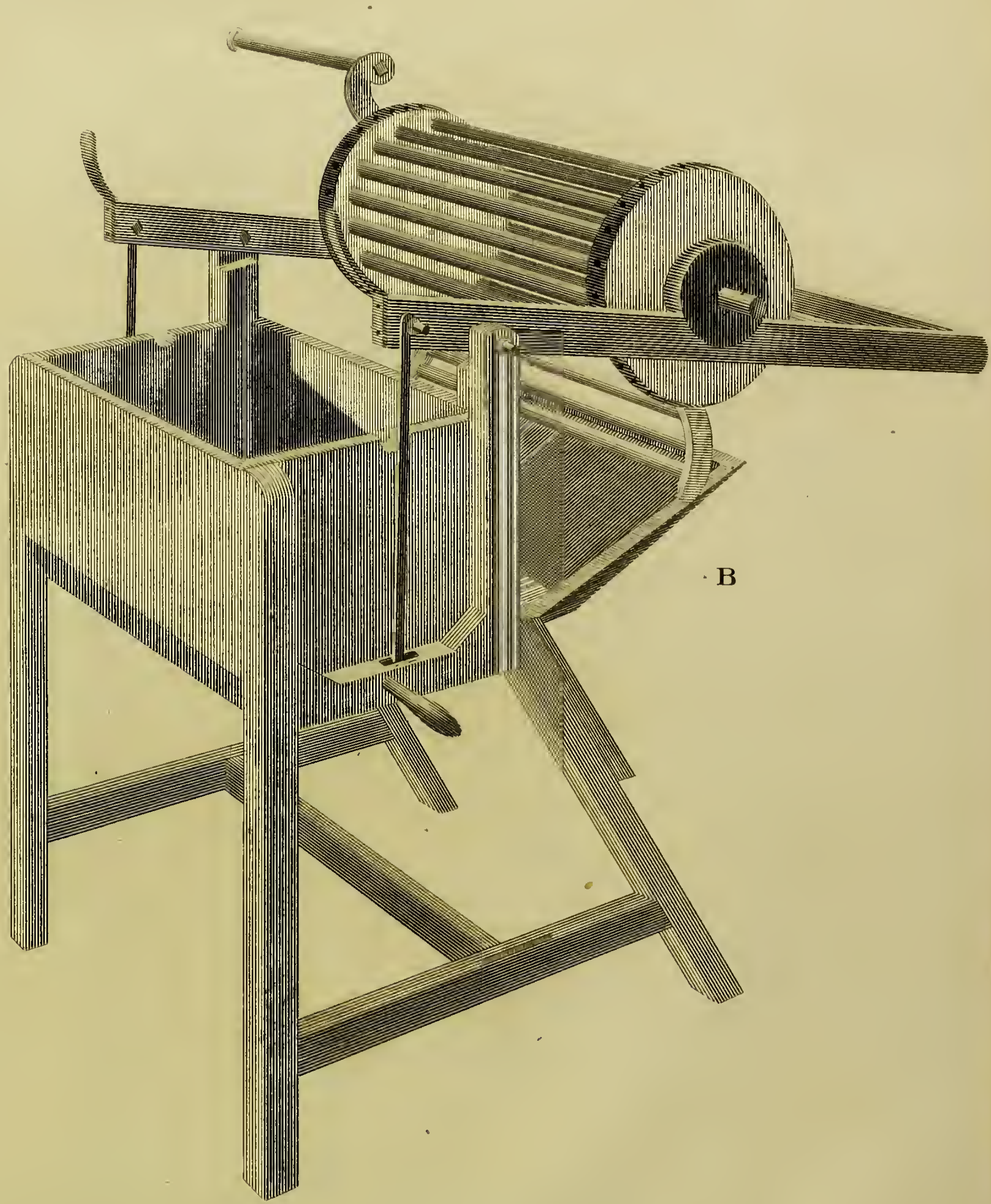
and preserving them through the winter. For the former, a machine on a simple construction has for some years been in use; that is, a cylinder made of staves, about an inch apart, turned slowly round in a trough full of water, so slow as to prevent the effect of the centripetal force, by which means the roots fall over each other and are effectually washed.

This machine, though the most simple in its form and application, wanted some improvement to assist it in discharging its contents. The roots were either taken out by the hand as they remained in the trough, or the cylinder was lifted out, by which means the water dripped disagreeably upon the person employed; to obviate which, I have added two levers united together, at the ends of which are fixed two hooks that catch into the grooves of two small wheels that run upon the axis of the cylinder, by which means it jumps out of the trough when the levers are depressed, which will be seen by the two figures in Plate 7, A as at work, B emptying out; by this addition a boy can do the work of a man, and without being exposed to the dripping water.

This machine does very much facilitate the process of washing, by which the animal may obtain clean food, and highly compensate me for the improvement, by giving comfort to man as well as beast, and at the same time assist in keeping up that laudable spirit of high feeding; for what can be more derogatory to common sense than to send cattle to market half fat? Notwithstanding the popular cry of the advocates for half-fed meat, who complain that a superabundance of the oleaginous substance is too much for their delicate palates, or that their cooks claim as a perquisite that which would give comfortable food to thousands, if it were properly mixed with vegetables, I never yet knew an objector to fat but what was fond of the lean in its neighbourhood; they, therefore, to procure this delicious morsel must suffer an imaginary loss by their cooks claiming a part of the fat as the refuse of the kitchen. The loss appears to them greater because it is of some value to the cook and to the public, though perhaps not quite so profitable as if it had been mixed with vegetables, and consumed as food for man. It is this value that makes the loss more apparent; for the epicure, who buys fish at a high price, does not look upon throwing away the shells as a loss because they are of no value; neither does he complain in the country of his meat being too fat, for two obvious reasons; he can procure a good supply of vegetables without the assistance of the green-grocer, and his cook has not that facility to dispose of the kitchen-stuff. It is only in town that a clamour about fat meat exists, and that by a few who purchase for the lean that accompanies it; amongst that few, some have taken up the pen to write against every means that tend to encourage what they call the over-feeding of animals. But how vain to attempt to write against the interest of the many, for the supposed benefit of the few! It is the grazier's interest to supply the market with that article which is most in demand; and that fat cattle is that article in every market, is very evident from the great price they fetch in proportion to their fatness. It is also well known to every man who provides for a family, if he is economist enough to make the observation, that fat meat goes farther than lean, and in consequence is the cheapest though purchased at an advanced price. It is also well known to every good cook and housewife, how to render the oleaginous substance not only palatable but extremely nutritive and pleasant, by a proper mixture of certain portions of the farinaceous and saccharine substances, therefore the advocates for half-fed cattle must look to some other cause than the existence of fat to support their argument of waste. It would be no difficult matter (were they possessed of the practical knowledge of a cattle breeder) to convince them, that the greatest waste arose from sending them to market before they were completely fat; and that instead of ridiculing the institution of the Smithfield Society, and Lord Somerville's Patriotic Meeting for the encouragement of good grazing, they should congratulate their country on its rapid progress to the attainment of useful knowledge, by which its inhabitants may be regularly supplied with food so congenial to its climate.

PLATE 7.


A


B

These gentlemen presume, that it is the intention of the supporters of the Smithfield Society to stimulate the graziers to feed all their meat as fat as the prize cattle, whereas nothing can be more foreign ; their true motive for their patronage, is to prove to the world which is the best kind of cattle to graze, and what is the most profitable food. Surely, when gentlemen associate for such laudable purposes, none but the unthinking can depreciate their intentions. What can be more beneficial to society than a practical inquiry into the nature and propensities of animals, particularly that kind that is food for man ?

The great Father of Inquiry (the renowned BAKEWELL, whose name has resounded throughout the cultivated earth, and whose memory will be venerated so long as good grazing shall exist) found that some animals had an aptitude to get fat sooner than others, and these he reserved, contrary to all former custom, for breeders. This new though rational practice enabled him to render his country so much service, by exhibiting to the world an improved species of animals never before seen, which created a spirit of inquiry, not only in his own country but throughout Europe. To facilitate which, Societies were instituted, where men assembled to communicate the result of their inquiries, for the information and ultimate good of mankind.

It has generally been observed, that those animals that have the greatest aptitude to grow fat, are mostly of a quiet domestic nature, not subject to irritation from fear, and delighting in a situation where they are not compelled to rove far about for food. This is a proof that too much motion is injurious to feeding ; and that animals when fat must be greatly injured by driving a great distance to market before they are slaughtered. What must be the extent of depreciation in the value of fat animals drove one hundred miles to Smithfield market in hot weather, through one continued cloud of dust, after which they are very often confined many hours, without food, before they are slaughtered ? If a fat animal after this violence can be in a healthful state, fit for the slaughter-house, it is contrary to all the known laws of animal mechanism. To obviate, in some measure, this disagreeable necessity to which the metropolis is subject, the Messrs. Pickfords have very ingeniously fitted up a pair of boats, on the Grand Junction Canal, to convey fat sheep to market ; in which two hundred and fifty-six are comfortably conveyed one hundred miles in forty-eight hours. The boats are divided into partitions, in two stories, with moveable iron rods, the lower tier of pens being below the gunwhales, the upper tier above, which consists of thirty-two partitions, each containing fifty-three square feet, in which are put four sheep.

When they arrive at Paddington, the partitions are taken down, and the boats loaded with bale goods for the country. I am informed, that the whole expense to the grazier is not more than three shillings per head. The benefit the inhabitants of London will derive from this mode of conveyance (when carried to the extent it will bear) needs no comment. The grazier will also receive an advantage, by having his sheep delivered at market in nearly the same state as they are in his pastures. The salesman will be the only person that can depreciate the importance of this eligible conveyance, and that solely through interested motives, by its removing the article for a short time out of his care ; in consequence of which, he cannot charge so much profit for his attendance as when he has them to keep upon the road. Notwithstanding any objection that may be made on that ground, (which is nothing more than the old and common cry that is so prevalent when any improvement changes the mode of employ—so loud is individual interest over public good) a few cargoes will prove the importance of this experiment, which has every physical reason to support it.

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